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Torigoe et al.

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(45) **Date of Patent: *Sep. 20, 2016**

(54) **COMPUTER-READABLE STORAGE MEDIUM HAVING INFORMATION PROCESSING PROGRAM STORED THEREIN, INFORMATION PROCESSING APPARATUS, INFORMATION PROCESSING SYSTEM, AND INFORMATION PROCESSING METHOD**

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(73) Assignee: **Nintendo Co., Ltd.**, Kyoto (JP)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 111 days.

This patent is subject to a terminal disclaimer.

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G06F 3/048 (2013.01)
G06F 3/0488 (2013.01)
G06F 3/0485 (2013.01)

(52) **U.S. Cl.**
CPC ***G06F 3/04883*** (2013.01); ***G06F 3/0485*** (2013.01)

(58) **Field of Classification Search**
CPC G06F 3/048
USPC 715/794, 781, 764, 700
See application file for complete search history.

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(57) **ABSTRACT**

An exemplary display area includes a scroll image display region for displaying a scroll target image. When at least either one of a result of a determination as to whether or not a touch position on the display area by a user has continuously been detected for a predetermined time on a first region which is located in a first direction (scrolling direction) with respect to a reference position or a result of a determination as to whether or not the touch position has shifted in a direction different from the first direction, is positive, the scroll target image is scrolled and displayed in the first direction.

14 Claims, 12 Drawing Sheets

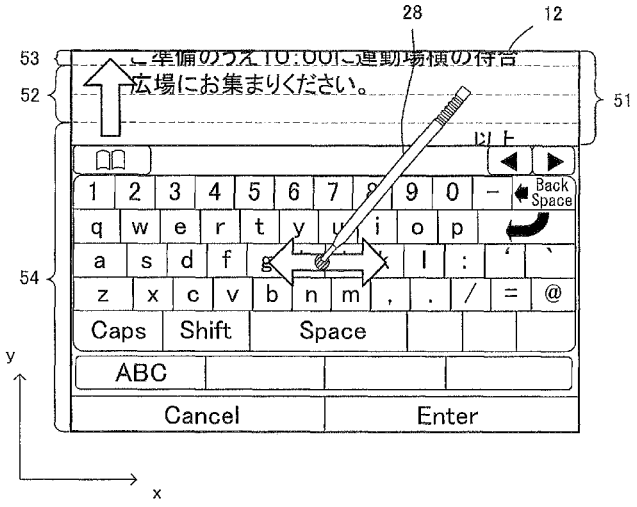

FIG. 1

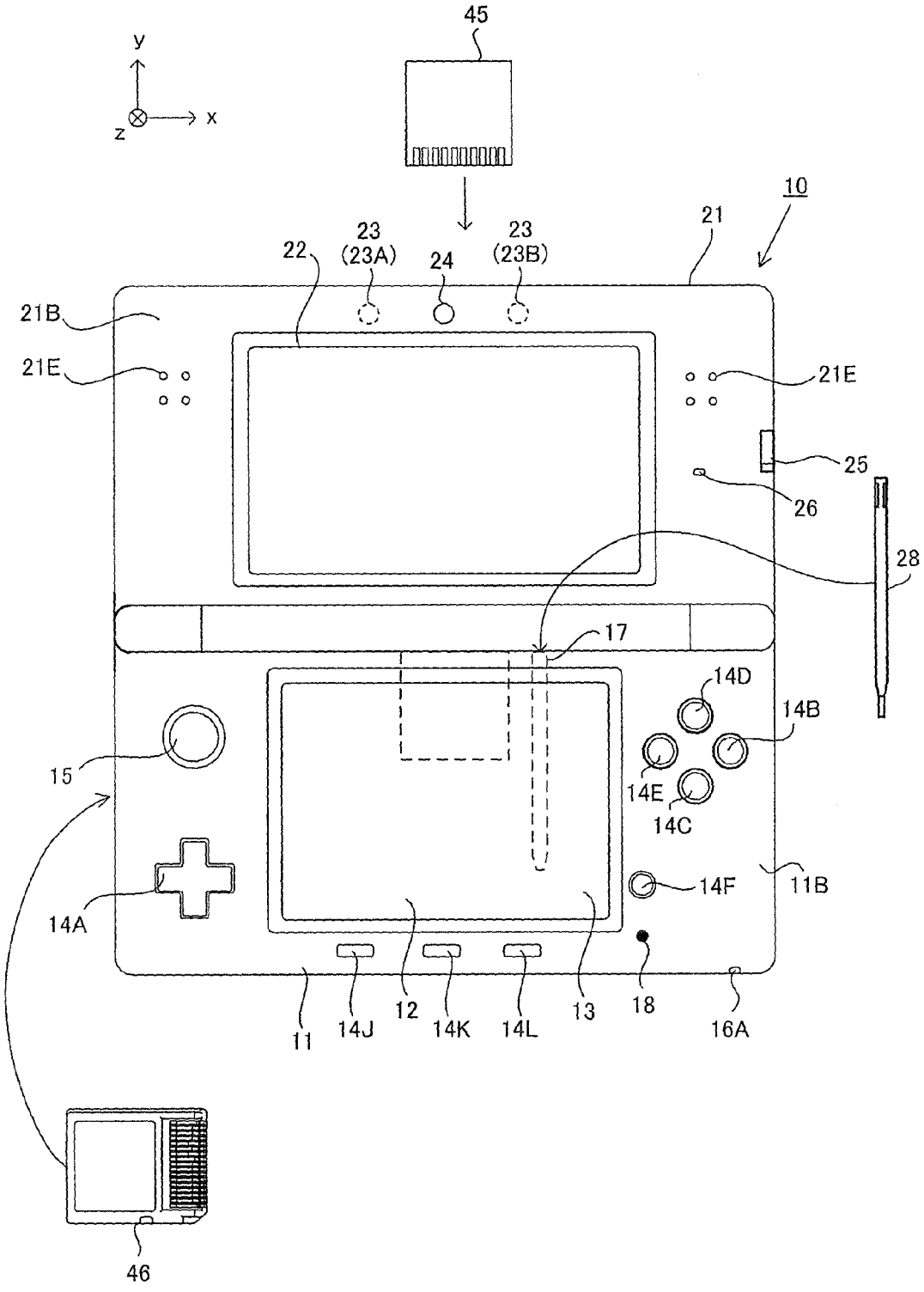
45
y
x
z
10
21
22
23
(23A)
24
23
(23B)
21B
21E
21E
25
26
28
17
14D
14B
15
14E
14C
14A
14F
11B
11
14J
12
14K
14L
13
18
16A
46

FIG. 2

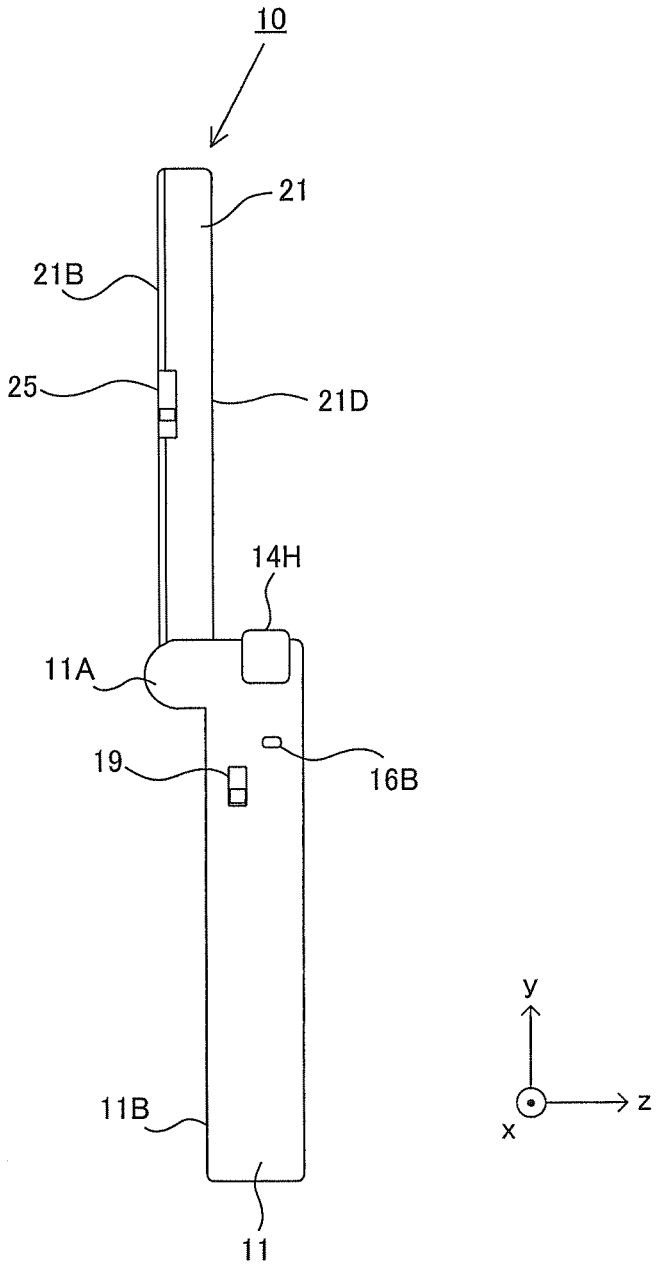

FIG. 3A

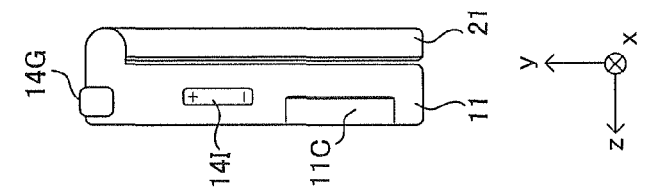

FIG. 3B

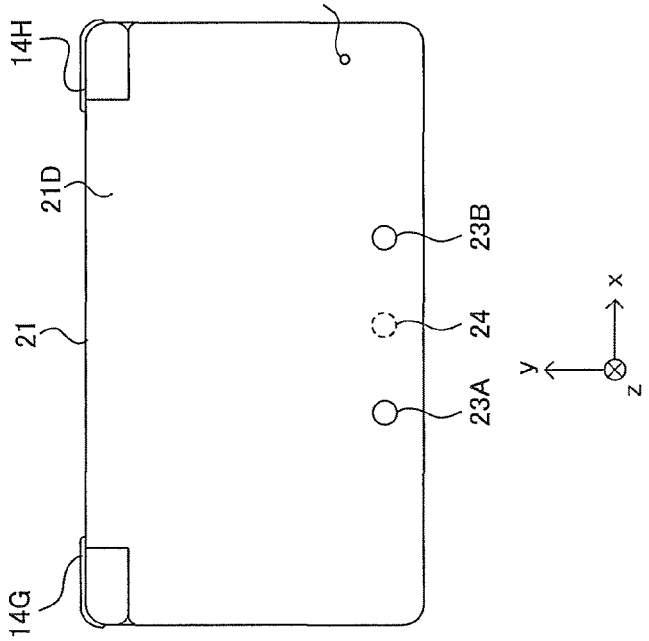

FIG. 3C

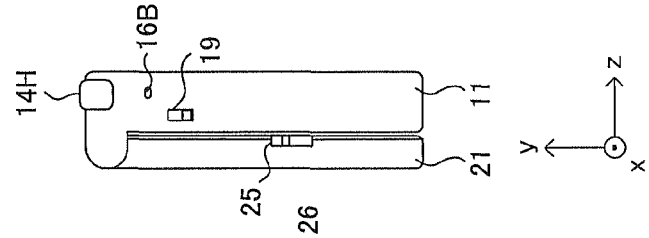

FIG. 3D

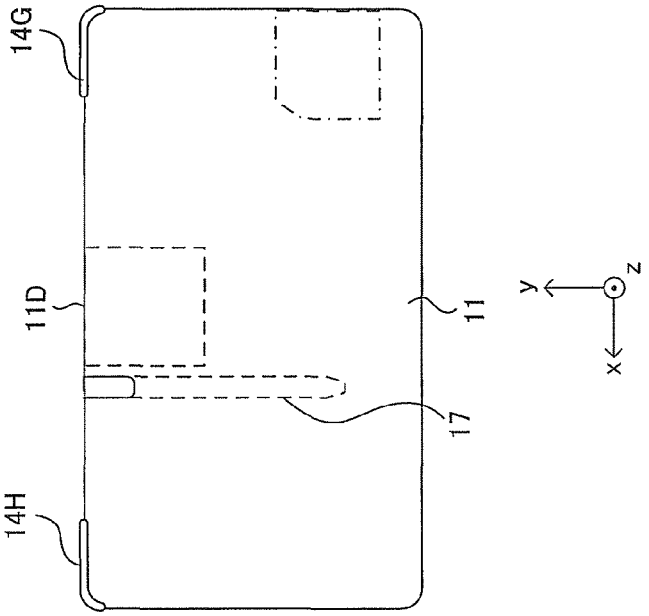

FIG. 4

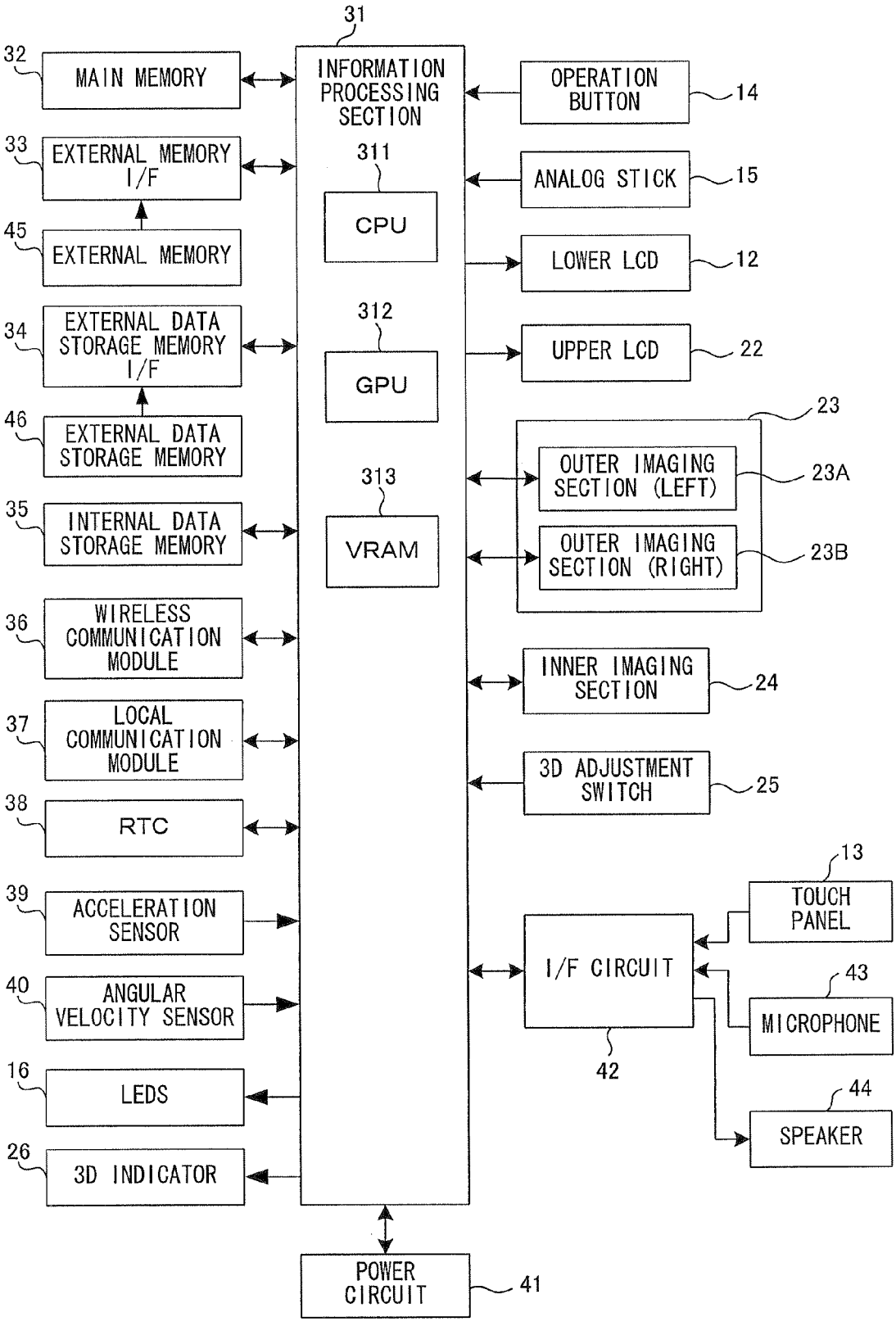
31
INFORMATION PROCESSING SECTION
311
CPU
312
GPU
313
VRAM
32
MAIN MEMORY
33
EXTERNAL MEMORY I/F
45
EXTERNAL MEMORY
34
EXTERNAL DATA STORAGE MEMORY I/F
46
EXTERNAL DATA STORAGE MEMORY
35
INTERNAL DATA STORAGE MEMORY
36
WIRELESS COMMUNICATION MODULE
37
LOCAL COMMUNICATION MODULE
38
RTC
39
ACCELERATION SENSOR
40
ANGULAR VELOCITY SENSOR
16
LEDS
26
3D INDICATOR
POWER CIRCUIT
41
OPERATION BUTTON
14
ANALOG STICK
15
LOWER LCD
12
UPPER LCD
22
23
OUTER IMAGING SECTION (LEFT)
23A
OUTER IMAGING SECTION (RIGHT)
23B
INNER IMAGING SECTION
24
3D ADJUSTMENT SWITCH
25
13
TOUCH PANEL
I/F CIRCUIT
42
43
MICROPHONE
44
SPEAKER

FIG. 5

12
53
52
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本日は晴天に恵まれ、格好の運動会日
和となりました。保護者の皆様、お手
元に赤　もしくは白のネームプレートを
1 2 3 4 5 6 7 8 9 0 − Back Space
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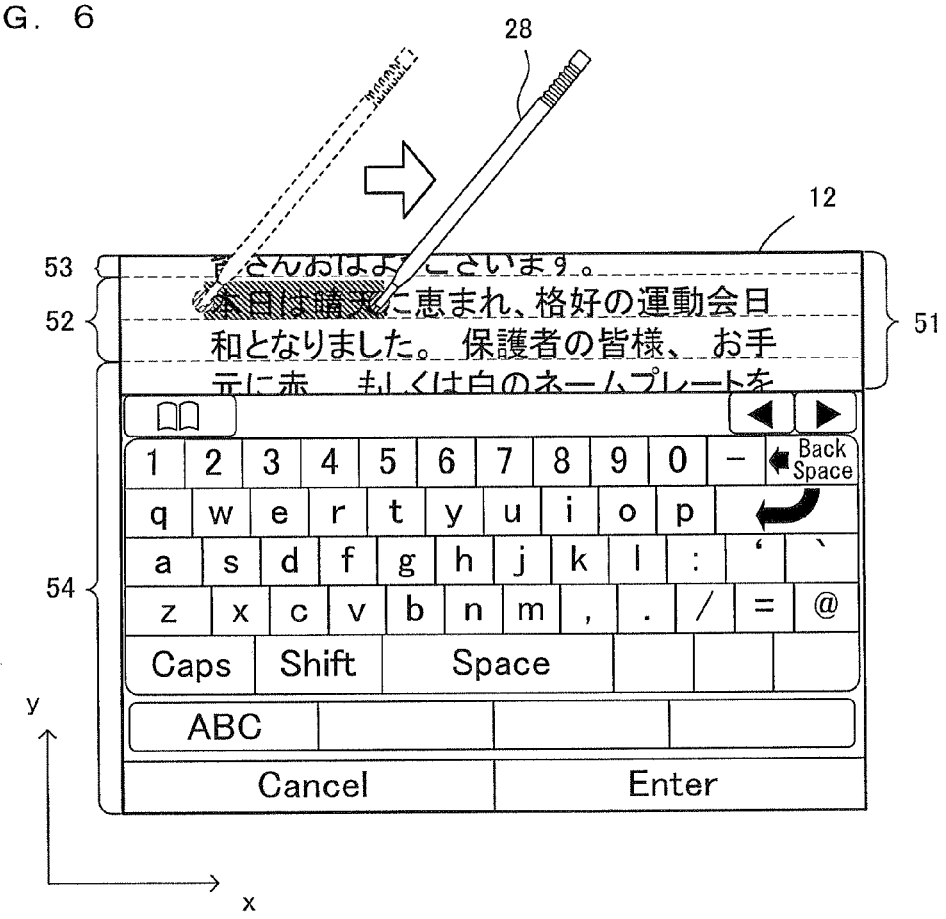
FIG. 6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本日は晴天に恵まれ、格好の運動会日
和となりました。保護者の皆様、お手
元に赤　もしくは白のネームプレートを
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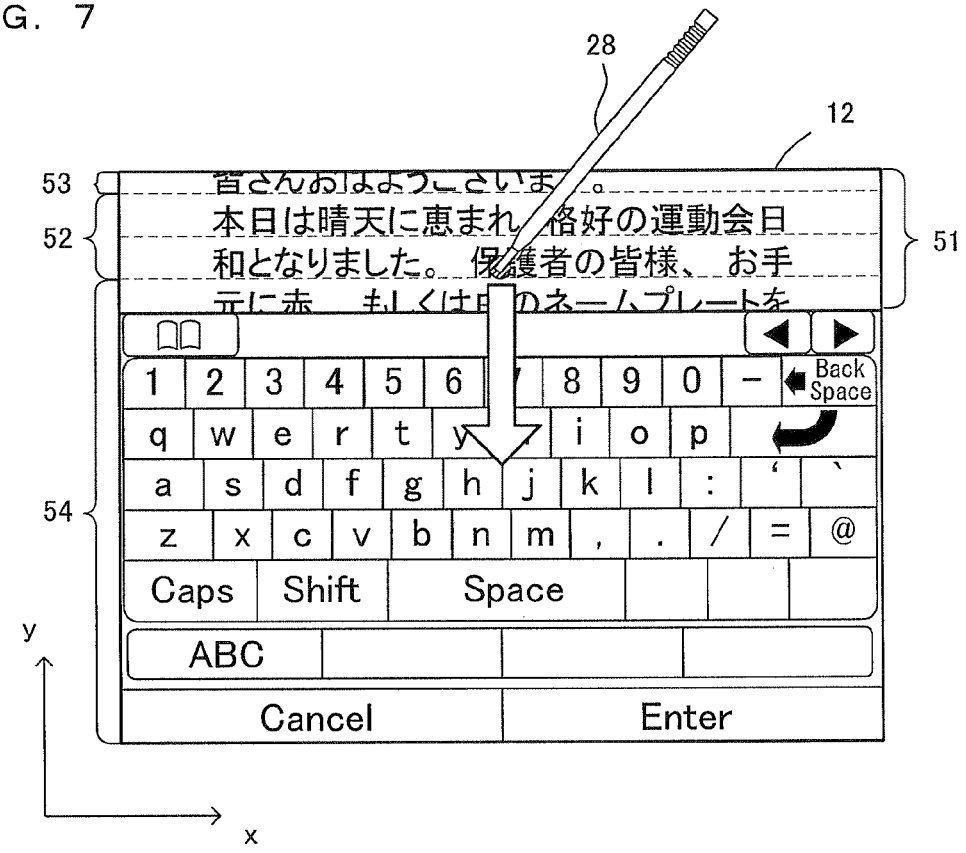
FIG. 7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本日は晴天に恵まれ、絶好の運動会日
和となりました。保護者の皆様、お手
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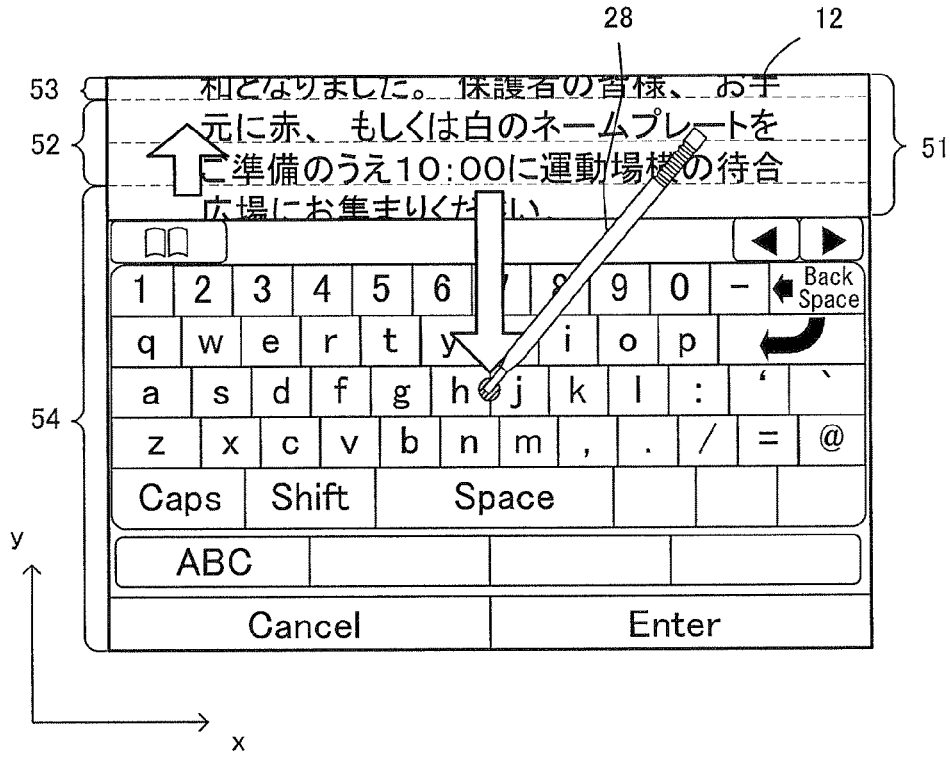
FIG. 8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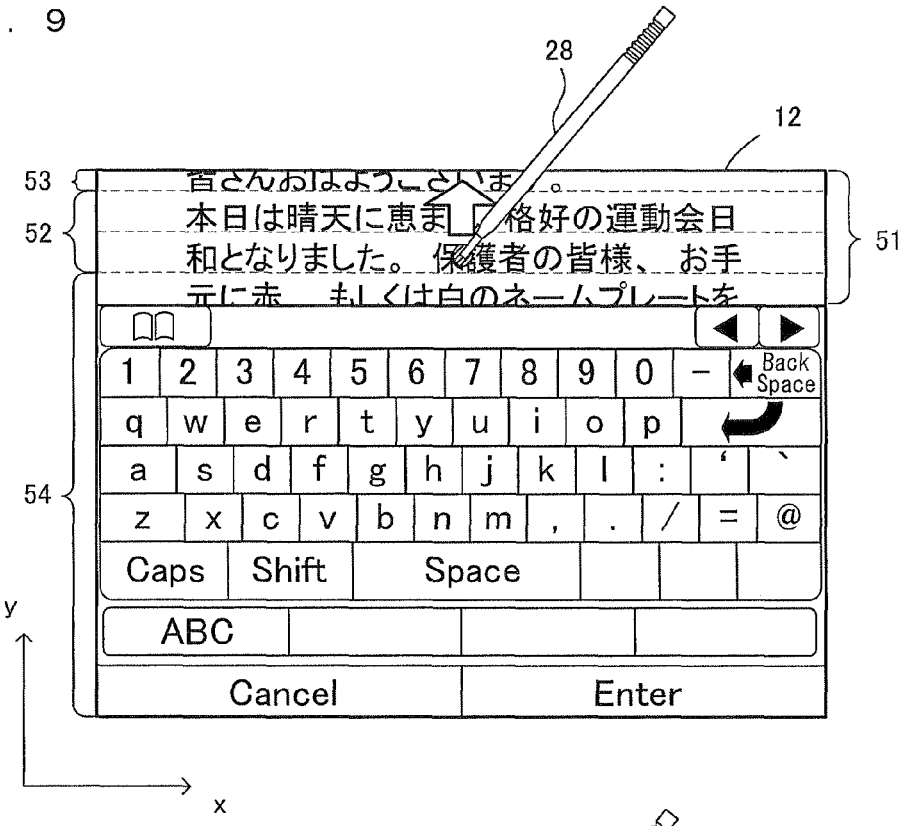
元に赤、もしくは白のネームプレートを
に準備のうえ10:00に運動場横の待合
1 2 3 4 5 6 7 8 9 0 − Back Space
q w e r t y u i o p
a s d f g h j k l : ‘ `
z x c v b n m , . / = @
Caps Shift Space
ABC
Cancel Enter
y
x

FIG. 9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本日は晴天に恵ま
格好の運動会日
和となりました。 保護者の皆様、 お手
Back Space
Caps
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Space
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Cancel
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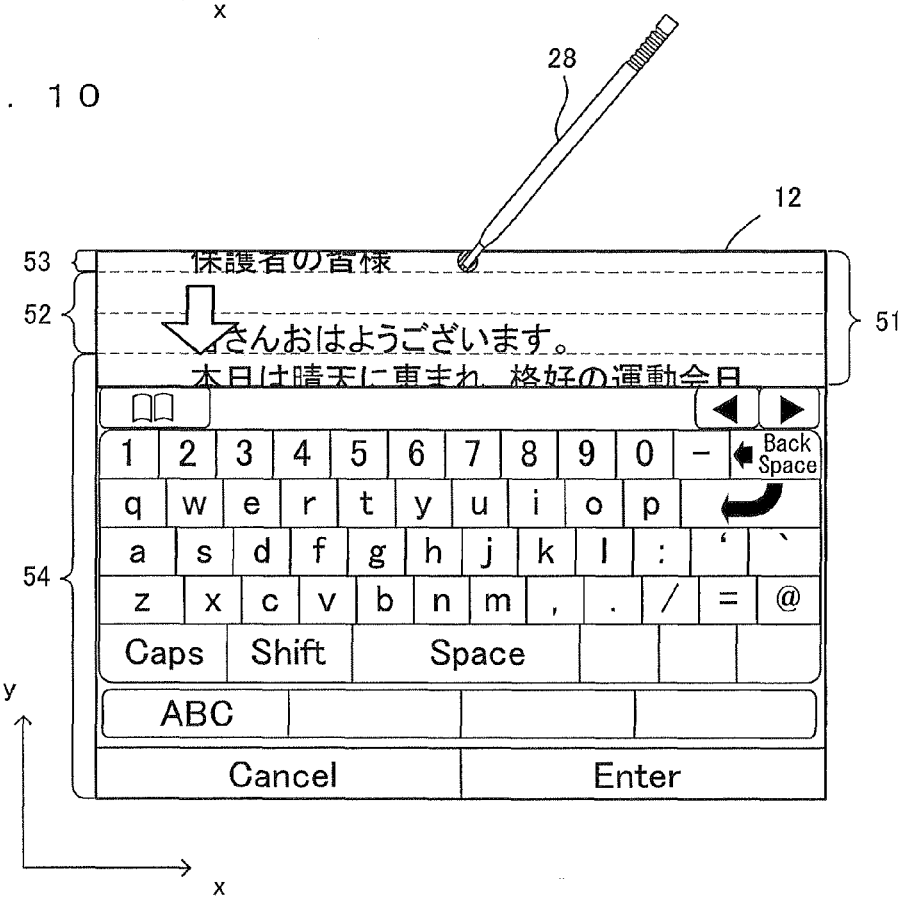
FIG. 10


28
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保護者の皆様
さんおはようございます。
Back Space
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Shift
Space
ABC
Cancel
Enter
y
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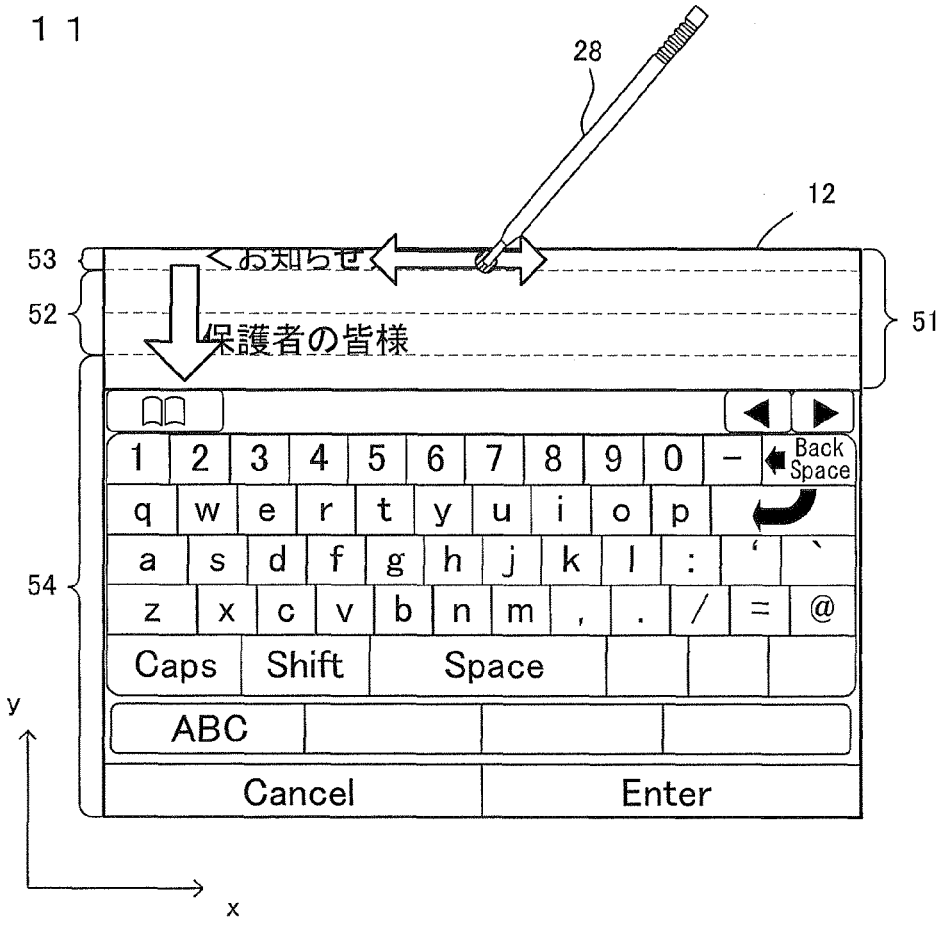
FIG. 11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保護者の皆様
Back Space
Caps
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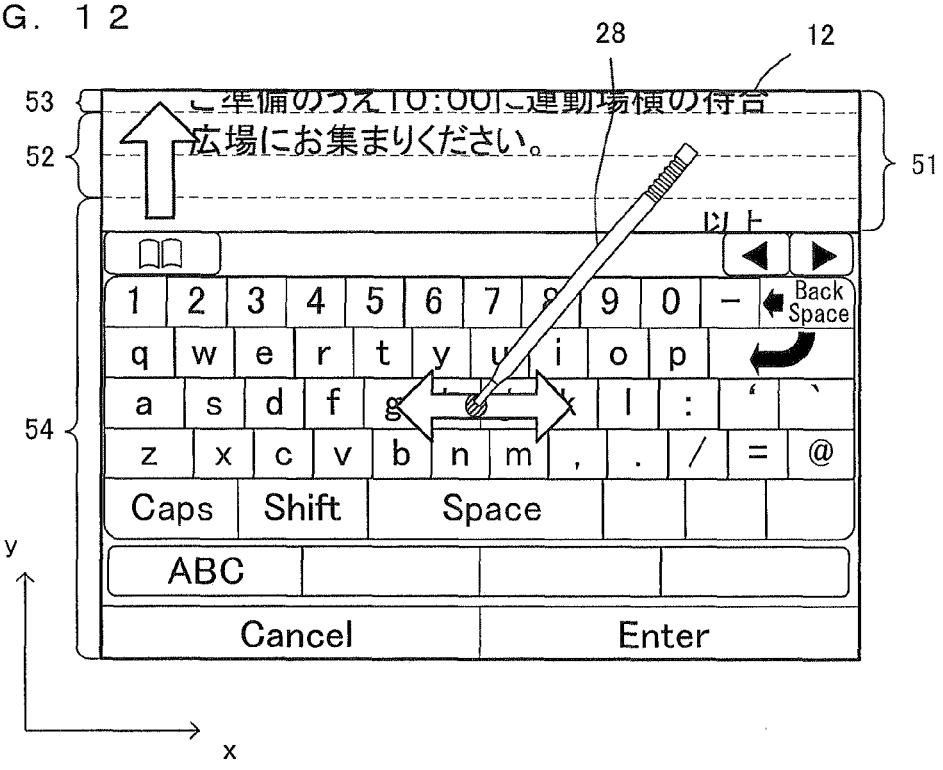
Space
ABC
Cancel
Enter
y
x

FIG. 12


28
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広場にお集まりください。
Back Space
Caps
Shift
Space
ABC
Cancel
Enter
y
x

FIG. 13

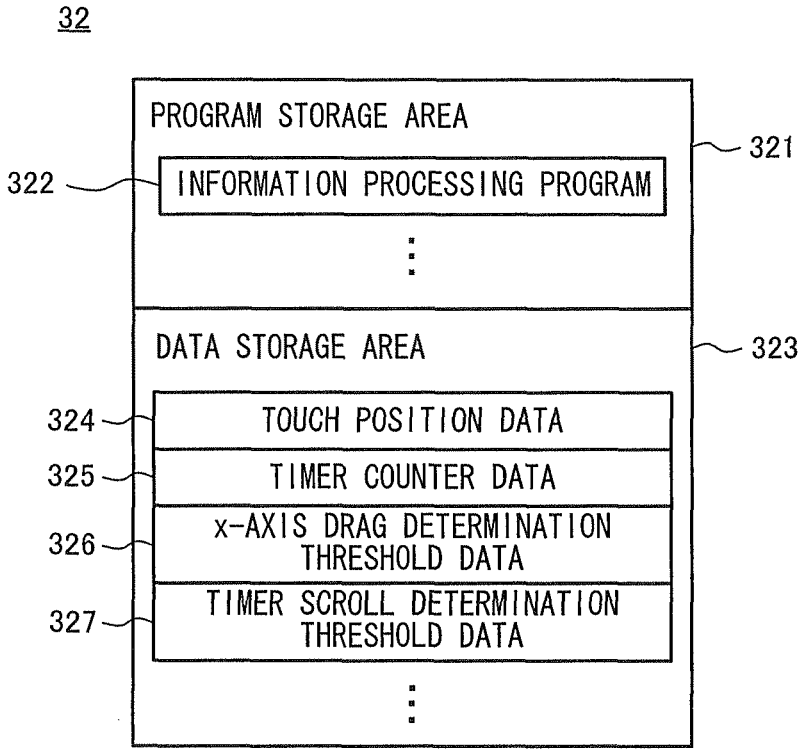

32
PROGRAM STORAGE AREA
321
322
INFORMATION PROCESSING PROGRAM
DATA STORAGE AREA
323
324
TOUCH POSITION DATA
325
TIMER COUNTER DATA
326
x-AXIS DRAG DETERMINATION THRESHOLD DATA
327
TIMER SCROLL DETERMINATION THRESHOLD DATA

FIG. 14

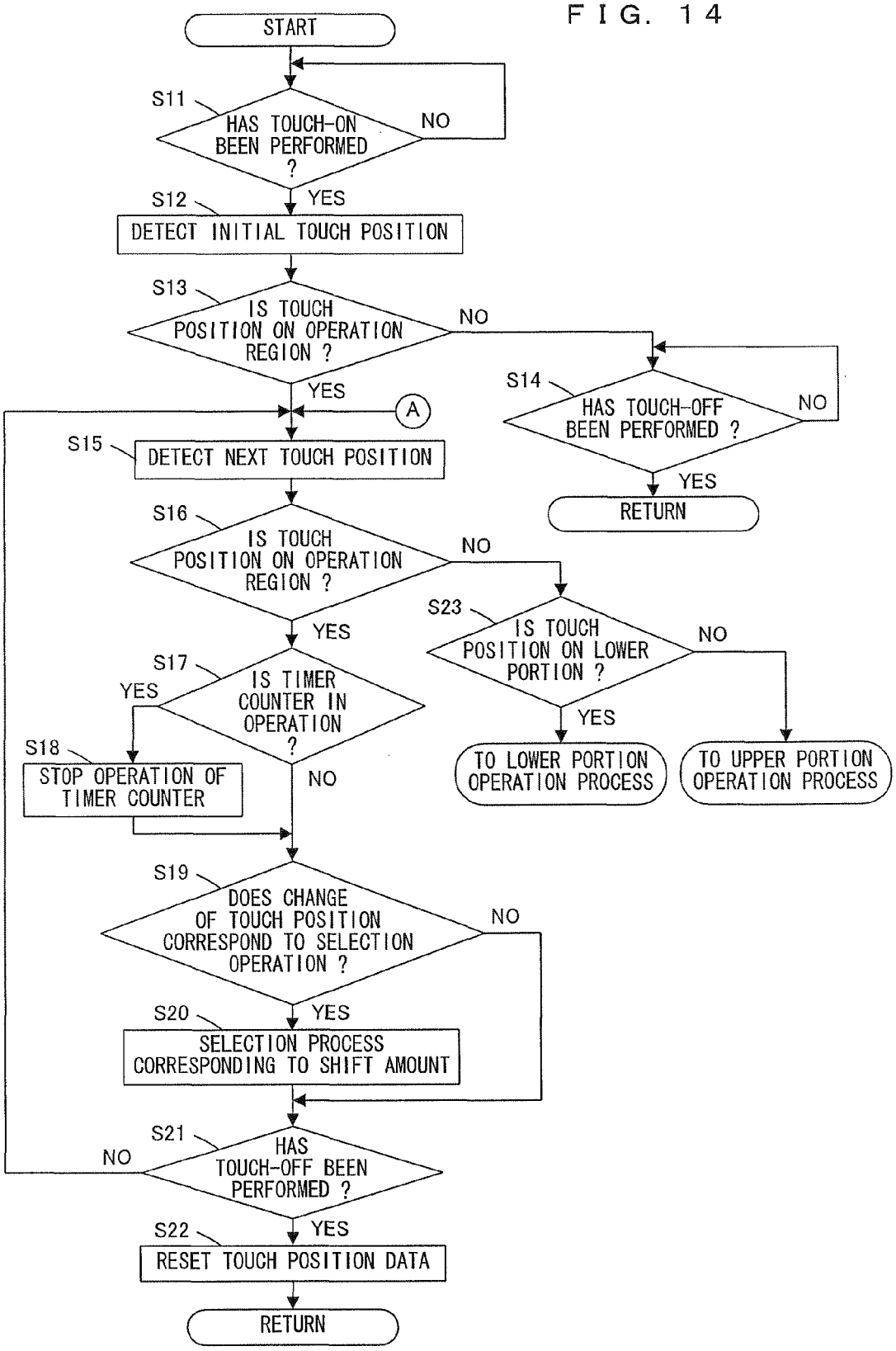

START
S11
HAS TOUCH-ON BEEN PERFORMED ?
NO
YES
S12
DETECT INITIAL TOUCH POSITION
S13
IS TOUCH POSITION ON OPERATION REGION ?
NO
YES
A
S14
HAS TOUCH-OFF BEEN PERFORMED ?
NO
YES
RETURN
S15
DETECT NEXT TOUCH POSITION
S16
IS TOUCH POSITION ON OPERATION REGION ?
NO
YES
S23
IS TOUCH POSITION ON LOWER PORTION ?
NO
YES
TO LOWER PORTION OPERATION PROCESS
TO UPPER PORTION OPERATION PROCESS
S17
IS TIMER COUNTER IN OPERATION ?
YES
NO
S18
STOP OPERATION OF TIMER COUNTER
S19
DOES CHANGE OF TOUCH POSITION CORRESPOND TO SELECTION OPERATION ?
NO
YES
S20
SELECTION PROCESS CORRESPONDING TO SHIFT AMOUNT
S21
HAS TOUCH-OFF BEEN PERFORMED ?
NO
YES
S22
RESET TOUCH POSITION DATA
RETURN

FIG. 15

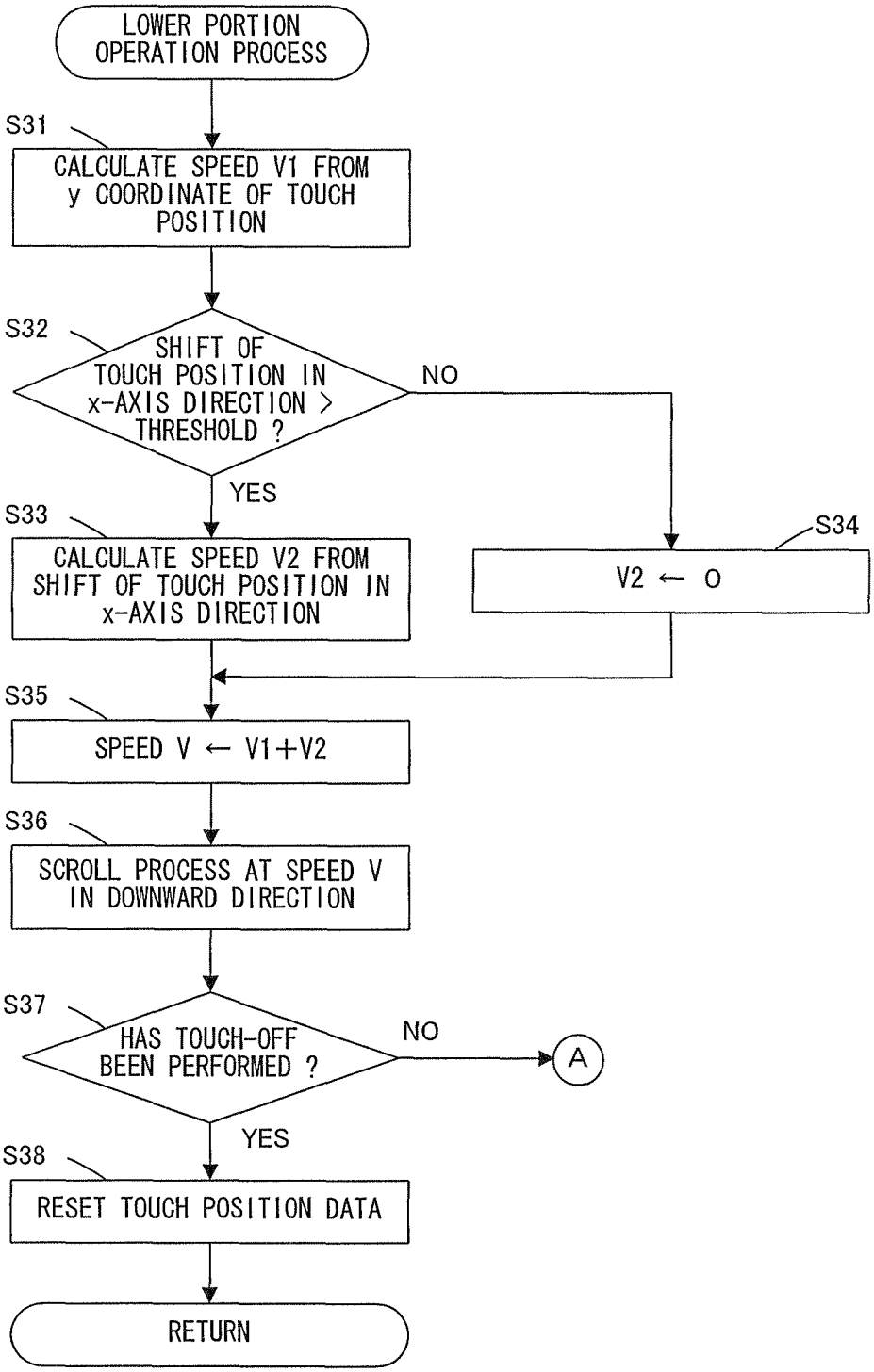
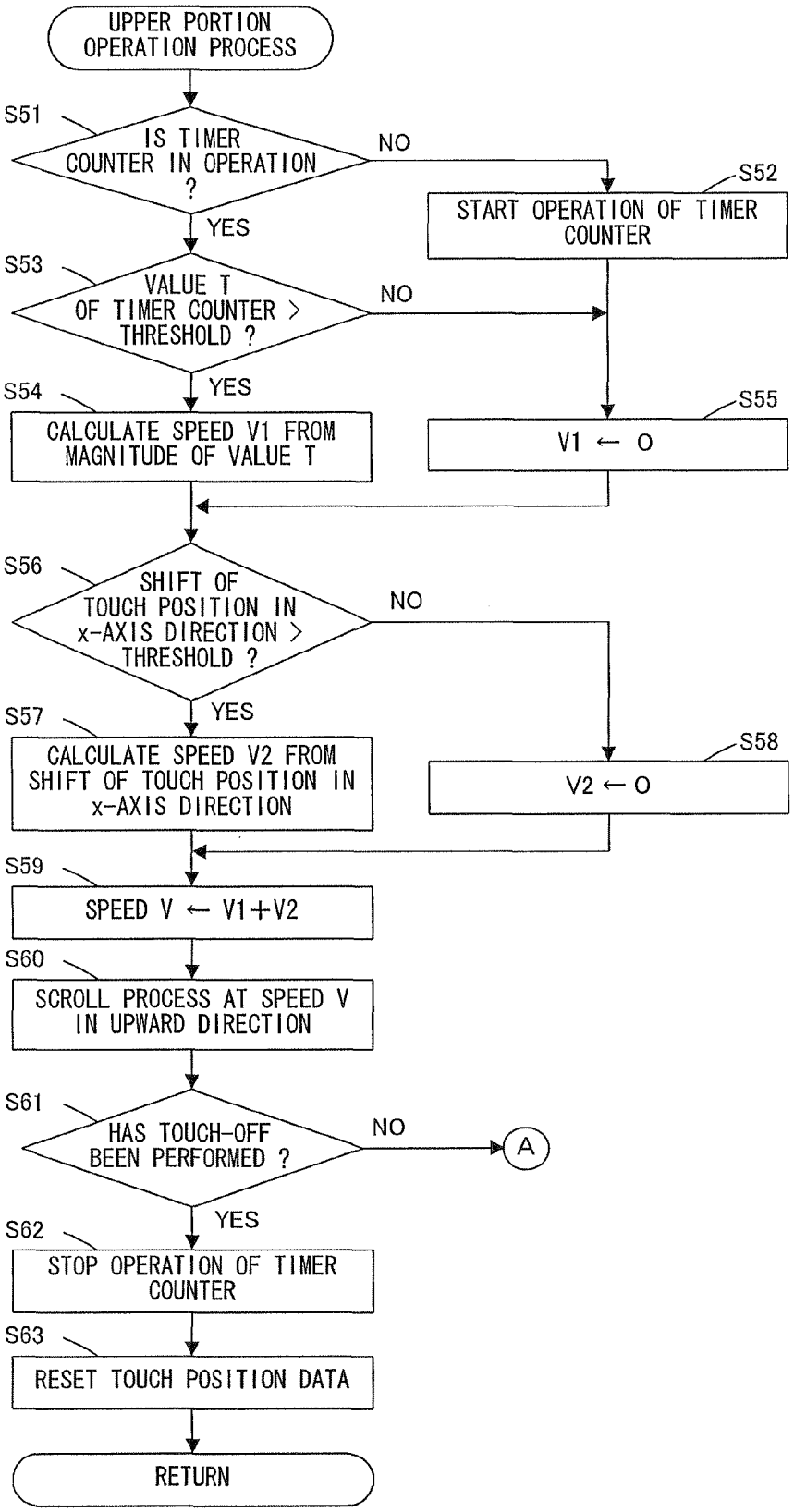

LOWER PORTION OPERATION PROCESS
S31
CALCULATE SPEED V1 FROM y COORDINATE OF TOUCH POSITION
S32
SHIFT OF TOUCH POSITION IN x-AXIS DIRECTION > THRESHOLD ?
NO
YES
S33
CALCULATE SPEED V2 FROM SHIFT OF TOUCH POSITION IN x-AXIS DIRECTION
S34
V2 ← 0
S35
SPEED V ← V1+V2
S36
SCROLL PROCESS AT SPEED V IN DOWNWARD DIRECTION
S37
HAS TOUCH-OFF BEEN PERFORMED ?
NO
A
YES
S38
RESET TOUCH POSITION DATA
RETURN

FIG. 16


UPPER PORTION OPERATION PROCESS
S51
IS TIMER COUNTER IN OPERATION ?
NO
YES
S52
START OPERATION OF TIMER COUNTER
S53
VALUE T OF TIMER COUNTER > THRESHOLD ?
NO
YES
S54
CALCULATE SPEED V1 FROM MAGNITUDE OF VALUE T
S55
V1 ← 0
S56
SHIFT OF TOUCH POSITION IN x-AXIS DIRECTION > THRESHOLD ?
NO
YES
S57
CALCULATE SPEED V2 FROM SHIFT OF TOUCH POSITION IN x-AXIS DIRECTION
S58
V2 ← 0
S59
SPEED V ← V1+V2
S60
SCROLL PROCESS AT SPEED V IN UPWARD DIRECTION
S61
HAS TOUCH-OFF BEEN PERFORMED ?
NO
A
YES
S62
STOP OPERATION OF TIMER COUNTER
S63
RESET TOUCH POSITION DATA
RETURN

COMPUTER-READABLE STORAGE MEDIUM HAVING INFORMATION PROCESSING PROGRAM STORED THEREIN, INFORMATION PROCESSING APPARATUS, INFORMATION PROCESSING SYSTEM, AND INFORMATION PROCESSING METHOD

CROSS REFERENCE TO RELATED APPLICATION

The disclosure of Japanese Patent Application No. 2010-272973, filed on Dec. 7, 2010, is incorporated herein by reference.

FIELD

The exemplary embodiments disclosed herein relate to a computer-readable storage medium having an information processing program stored therein, an information processing apparatus, an information processing system, and an information processing method, and more particularly, relate to a computer-readable storage medium having stored therein an information processing program executed by an information processing apparatus, an information processing apparatus, an information processing system, and an information processing method, which perform information processing corresponding to an operation performed by a user with input means.

BACKGROUND AND SUMMARY

Conventionally, when an image larger than the display area of a display section is displayed, the image is scrolled and displayed in accordance with a scroll operation. Thus, for example, a scroll instruction region (drag operation region) where a scroll operation is possible may be provided in the display section.

Meanwhile, in order to perform a process such as a selection operation on an image displayed on the display area, an operation region for this operation has to be provided in the display area. Therefore, the above scroll instruction region has to be located in a region other than the operation region. Meanwhile, in recent years, information processing apparatuses have been decreased in size, and their display sections also have been decreased in size. Thus, it is desired to increase the proportion of the display area in the display section. In such a case, a region other than an operation region where an operation is performed on an image displayed on the display area is decreased in size, and this leads to a decreased region where a scroll instruction region can be located. Therefore, the region where the scroll instruction region can be located is short in the scrolling direction, and it is difficult to perform a drag operation in the scrolling direction which is performed in conventional scrolling technology.

Therefore, a feature of certain exemplary embodiments is to provide a computer-readable storage medium having an information processing program stored therein, an information processing apparatus, an information processing system, and an information processing method which allow a scroll operation to be performed with good operability even in a situation where a scroll instruction region is short in a scrolling direction.

Certain exemplary embodiments have the following features to attain the object mentioned above. It is noted that descriptions in parentheses are merely provided to facilitate the understanding of certain exemplary embodiments in relation to later-described embodiments, rather than limiting the scope of certain exemplary embodiments in any way.

An aspect of certain exemplary embodiments is configured as a computer-readable storage medium having stored therein an information processing program executed by a computer of an information processing apparatus which includes a display area having a scroll image display region for displaying a scroll target image. The information processing program causes the computer to operate as pointed position detector, first scroll instruction determination section, second scroll instruction determination section, and scrolling controller. The pointed position detector sequentially is configured to detect a pointed position on the display area by a user. The first scroll instruction determination section is configured to determine whether or not the pointed position detected by the pointed position detector has continuously been detected for a predetermined time on a first region which is located in a first direction (a y-axis positive direction shown in FIG. **5**) with respect to a reference position. The second scroll instruction determination section is configured to determine whether or not the pointed position detected by the pointed position detector has shifted in a direction different from the first direction. The scrolling controller is configured to scroll the scroll target image in the first direction when at least either one of results of the determinations of the first scroll instruction determination section and the second scroll instruction determination section is positive.

According to this configuration, the user can cause the scroll target image to be scrolled and displayed in the first direction (to move with respect to the scroll image display region in the direction opposite to the first direction), by keeping the pointed position in the predetermined first region for the predetermined time. In addition, the user can cause the scroll target image to be scrolled and displayed in the first direction, also by moving the pointed position in the direction different from the first direction. In other words, the user can cause scroll display to be performed by waiting for elapse of the predetermined time, and the user can also cause scroll display to be performed without waiting for the elapse of the predetermined time. Due to this, the operability improves.

The first region may be a region which is used for a scroll instruction, the scroll image display region may include a second region, and the first region may be located in the first direction (the y-axis positive direction shown in FIG. **5**) with respect to the second region. In this case, the second scroll instruction determination section determines whether or not the pointed position detected by the pointed position detector has shifted in the first region in the direction different from the first direction.

According to this configuration, the user can cause the scroll target image to be scrolled and displayed in the first direction (to move with respect to the scroll image display region in the direction opposite to the first direction), by keeping the pointed position in the first region (a scroll instruction region) for the predetermined time. In addition, the user can cause the scroll target image to be scrolled and displayed in the first direction, also by moving the pointed position in the scroll instruction region in the direction different from the first direction. In other words, the user can cause scroll display to be performed by waiting for elapse of the predetermined time, and the user can also cause scroll display to be performed without waiting for the elapse of the predetermined time. Due to this, the operability for scroll display improves.

The information processing program may further cause the computer to operate as scrolling amount setter configured to set a scrolling amount by which the scroll target image is to be scrolled in the first direction. The scrolling amount setter sets a first scrolling amount on the basis of a time for which the pointed position detected by the pointed position detector is located on the first region. The scrolling amount setter sets a second scrolling amount on the basis of a second shift amount by which the pointed position detected by the pointed position detector has shifted in the first region in the direction different from the first direction. The scrolling controller scrolls the scroll target image in the first direction by a scrolling amount that is a sum of the first scrolling amount and the second scrolling amount which are set by the scrolling amount setter.

According to this configuration, by a first operation of keeping the pointed position in the first region (a scroll instruction region) for the predetermined time, the user can cause the scroll target image to be scrolled and displayed in the first direction (to move with respect to the scroll image display region in the direction opposite to the first direction) by a scrolling amount (H**1**) corresponding to the time. In addition, by a second operation of moving the pointed position in the scroll instruction region in the direction different from the first direction, the user also can cause the scroll target image to be scrolled and displayed in the first direction by a scrolling amount (H**2**) corresponding to the shift amount. Therefore, the user whose desires to cause scroll display to be performed immediately can cause the scroll target image to be scrolled and displayed by the second operation without waiting for the elapse of the predetermined time by the first operation. Further, by performing the second operation for the predetermined time, the first operation is also performed at the same time, and hence the scrolling amount by which the scroll target image is to be scrolled is H**1**+H**2**. Thus, by performing the first and second operations, the user can cause scroll display to be performed by a scrolling amount greater than a scrolling amount (H**1** or H**2**) corresponding to one operation.

The process by the scrolling amount setter may be as follows. Specifically, the scrolling amount setter sets a first scrolling amount by which scrolling is to be performed per unit time, on the basis of a time for which the pointed position detected by the pointed position detector is located on the first region, and sets a second scrolling amount by which scrolling is to be performed per unit time, on the basis of a shift amount of the pointed position detected by the pointed position detector has shifted in the first region in the direction different from the first direction. In this case, the scrolling controller scrolls the scroll target image in the first direction by a scrolling amount that is a sum of the first scrolling amount and the second scrolling amount which are set by the scrolling amount setter, per unit time.

According to this configuration, by a first operation of keeping the pointed position in the first region (a scroll instruction region) for the predetermined time, the user can cause the scroll target image to be scrolled and displayed in the first direction (to move with respect to the scroll image display region in the direction opposite to the first direction) by an amount which corresponds to the predetermined time and by which scrolling is to be performed per unit time (i.e., at a speed V**1**). In addition, by a second operation of moving the pointed position in the scroll instruction region in the direction different from the first direction, the user can cause the scroll target image to be scrolled and displayed in the first direction by an amount which corresponds to the shift amount and by which scrolling is to be performed per unit time (i.e., at a speed V**2**). Therefore, the user whose desires to cause scroll display to be performed immediately can cause the scroll target image to be scrolled and displayed by the second operation without waiting for the elapse of the predetermined time by the first operation. Further, by performing the second operation for the predetermined time, the first operation is also performed at the same time, and hence the speed of scrolling by which the scroll target image is to be scrolled is V**1**+V**2**. Thus, by performing the first and second operations, the user can cause scroll display to be performed at a speed faster than a scrolling speed (V**1** or V**2**) corresponding to one operation.

The process by the scrolling amount setter may be as follows. Specifically, the scrolling amount setter sets the second scrolling amount in accordance with a length of a track on which the pointed position detected by the pointed position detector has moved in the first region from a predetermined reference position in the direction different from the first direction.

According to this configuration, also by reciprocating the pointed position in the first region (scroll instruction region) in the direction different from the first direction (scrolling direction), the user can increase the length of a track on which the pointed position moves in the direction different from the first direction. Thus, even when a region where it is possible to move the pointed position in the direction different from the first direction is small, it is possible to increase the length of the track by repeating the reciprocation, and thus it is possible to increase the scrolling amount which is set in accordance with the length (e.g., to increase the speed of scrolling).

The process by the scrolling amount setter may be as follows. Specifically, the scrolling amount setter sets the second scrolling amount in accordance with a shift amount by which the pointed position detected by the pointed position detector has shifted in the first region from a predetermined reference position in the direction different from the first direction.

According to this configuration, by changing a moving amount (distance) by which the pointed position moves from the predetermined reference position in the direction different from the first direction (scrolling direction) in the first region (scroll instruction region) located within the scroll image display region, the user can change the scrolling amount which is set in accordance with the moving amount. Therefore, the user can keep the scrolling amount (e.g., the speed of scrolling) constant until elapse of a predetermined time by keeping the pointed position at a certain point without continuously moving the pointed position.

The process by the scrolling amount setter may be as follows. Specifically, the scrolling amount setter sets the second scrolling amount in accordance with a shift amount by which the pointed position detected by the pointed position detector has shifted in the first region in the direction different from the first direction within a predetermined time.

According to this configuration, by changing a speed at which the pointed position moves in the direction different from the first direction (scrolling direction) in the first region (scroll instruction region), the user can change the scrolling amount which is set in accordance with the speed. In other words, the user can change the scrolling amount (e.g., the speed of scrolling) by an intuitive operation in which when the pointed position is moved fast, the scrolling amount increases.

The process by the second scroll instruction determination section may be as follows. Specifically, the second scroll

instruction determination section determines whether or not the pointed position detected by the pointed position detector has shifted in the first region in the direction different from the first direction within a predetermined time by an amount exceeding a predetermined threshold.

According to this configuration, by moving the pointed position at a predetermined speed or higher in the first region (scroll instruction region) in the direction different from the first direction (scrolling direction), the user can cause the scroll target image to be scrolled and displayed in the first direction (to move with respect to the scroll image display region in the direction opposite to the first direction). Therefore, it can be avoided that scroll display is performed until elapse of the predetermined time, when the user can be considered not to intend to increase the speed of scroll display as in the case where the user slowly moves the pointed position in the direction different from the first direction.

The direction different from the first direction may be a direction orthogonal to the first direction.

In general, in order to increase the size of a displayed portion of the scroll target image as much as possible, it is desired to increase the size of the scroll image display region in the scrolling direction. In such a case, the second region (e.g., a selection operation region for selecting a part of an image) within the scroll image display area also has to be increased in size in the scrolling direction, and thus the length (width) of the first region (scroll instruction region) in the scrolling direction is shortened. However, the length (width) of the scroll instruction region in the direction orthogonal to the scrolling direction is not shortened. According to this configuration, the length (width) of the scroll instruction region in the direction orthogonal to the scrolling direction is sufficient for the user to move the pointed position, and thus the user can cause scroll display to be performed, by moving the pointed position in this direction.

In the above description, certain exemplary embodiments are configured as computer-readable storage medium having stored therein an information processing program executed by a computer of an information processing apparatus. However, certain exemplary embodiments may be configured as an information processing apparatus, an information processing system, or an information processing method.

According to certain exemplary embodiments, an information processing program, an information processing apparatus, an information processing system, and an information processing method which allow a scroll operation to be performed with good operability even in a situation where a scroll instruction region is short in a scrolling direction.

These and other objects, features, aspects and advantages of certain exemplary embodiments will become more apparent from the following detailed description of certain exemplary embodiments when taken in conjunction with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a front view of a non-limiting example of a game apparatus **10** in an opened state;

FIG. **2** is a right side view of a non-limiting example of the game apparatus **10** in an opened state;

FIG. **3**A is a left side view of a non-limiting example of the game apparatus **10** in a closed state;

FIG. **3**B is a front view of a non-limiting example of the game apparatus **10** in a closed state;

FIG. **3**C is a right side view of a non-limiting example of the game apparatus **10** in a closed state;

FIG. **3**D is a rear view of a non-limiting example of the game apparatus **10** in a closed state;

FIG. **4** is a block diagram illustrating a non-limiting example of an internal configuration of the game apparatus **10**;

FIG. **5** is a diagram illustrating a non-limiting example of an image displayed on a display screen of a lower LCD **12**;

FIG. **6** is a diagram illustrating a non-limiting example of an operation performed by a user on the display screen of the lower LCD **12**;

FIG. **7** is a diagram illustrating a non-limiting example of an operation performed by the user on the display screen of the lower LCD **12**;

FIG. **8** is a diagram illustrating a non-limiting example of an operation performed by the user on the display screen of the lower LCD **12**;

FIG. **9** is a diagram illustrating a non-limiting example of an operation performed by the user on the display screen of the lower LCD **12**;

FIG. **10** is a diagram illustrating a non-limiting example of an operation performed by the user on the display screen of the lower LCD **12**;

FIG. **11** is a diagram illustrating a non-limiting example of an operation performed by the user on the display screen of the lower LCD **12**;

FIG. **12** is a diagram illustrating a non-limiting example of an operation performed by the user on the display screen of the lower LCD **12**;

FIG. **13** is a non-limiting example of a memory map of a main memory **32**;

FIG. **14** is a flowchart illustrating a non-limiting example of processing executed by a CPU **311**;

FIG. **15** is a flowchart illustrating a non-limiting example of processing executed by the CPU **311**; and

FIG. **16** is a flowchart illustrating a non-limiting example of processing executed by the CPU **311**.

DETAILED DESCRIPTION OF NON-LIMITING EXAMPLE EMBODIMENTS

Hereinafter, with reference to the drawings, an information processing apparatus according to an exemplary embodiment will be described. It is noted that the information processing apparatus of the exemplary embodiments disclosed herein, and an information processing program executed by the information processing apparatus are applicable to any computer system. In the exemplary embodiment, a case where a hand-held game apparatus **10** which is an example of the information processing apparatus executes an information processing program stored in an external memory **45** will be described as an example.

[Configuration of Game Apparatus **10**]

FIG. **1** is a front view of the game apparatus **10** in an opened state. FIG. **2** is a right side view of the game apparatus **10** in the opened state. FIG. **3**A is a left side view of the game apparatus **10** in a closed state. FIG. **3**B is a front view of the game apparatus **10** in the closed state. FIG. **3**C is a right side view of the game apparatus **10** in the closed state. FIG. **3**D is a rear view of the game apparatus **10** in the closed state.

The game apparatus **10** includes an imaging section for shooting an image, and is able to display a shot image on a screen and save data of the shot image. In addition, the game apparatus **10** can execute a program which is stored in an exchangeable memory card (external memory **45**), or a

program which is received from a server or another game apparatus. By executing these programs, the game apparatus **10** can also display, on the screen, an image that is generated by performing computer graphics processing for an image shot by a virtual camera set in a virtual space.

The game apparatus **10** includes a lower housing **11** and an upper housing **21**. The lower housing **11** and the upper housing **21** are connected to each other so as to be openable and closable. Therefore, the game apparatus **10** can be folded. The game apparatus **10** is used in an opened state as shown in FIG. **1**. When the game apparatus **10** is not used, the game apparatus **10** is kept in a closed state (see FIGS. **3**A to **3**D).

[Configuration of Lower Housing **11**]

In the lower housing **11**, a lower LCD (Liquid Crystal Display) **12**, a touch panel **13**, operation buttons **14**A to **14**L (FIGS. **1** and **3**A to **3**D), an analog stick **15**, an LED **16**A and an LED **16**B, an insertion opening **17**, and a microphone hole **18** are provided.

The lower LCD **12** has a display screen whose length in the right-left direction (x-axis direction) is longer than the length in the up-down direction (y-axis direction), and is provided at the center of an inner side surface **11**B of the lower housing **11**. The number of pixels of the lower LCD **12** is, as one example, 320 dots×240 dots (the longitudinal line×the vertical line), which is not limited thereto. The lower LCD **12** is a display device for displaying an image in a planar manner (not in a stereoscopically visible manner), which is different from the upper LCD **22** as described below.

It is noted that although an LCD is used as a display device in the exemplary embodiment, any other display device such as a display device using an EL (Electro Luminescence), or the like may be used.

As shown in FIG. **1**, the game apparatus **10** includes the touch panel **13** which functions as input means. The touch panel **13** is mounted on the screen of the lower LCD **12** in such a manner as to cover the screen. In the exemplary embodiment, the touch panel **13** may be, but is not limited to, a resistive film type touch panel. A touch panel of any press type such as electrostatic capacitance type may be used. In the exemplary embodiment, the touch panel **13** has the same resolution (detection accuracy) as that of the lower LCD **12**. However, the resolution of the touch panel **13** and the resolution of the lower LCD **12** may not necessarily be the same.

The insertion opening **17** (indicated by dashed lines in FIGS. **1** and **3**D) is provided on the upper side surface of the lower housing **11**. The insertion opening **17** is used for accommodating a touch pen **28** which is used for performing an operation on the touch panel **13**. Although an input on the touch panel **13** is usually made by using the touch pen **28**, a finger of a user may be used for making an input on the touch panel **13**, in addition to the touch pen **28**.

The operation buttons **14**A to **14**L are each an input device for making a predetermined input. As shown in FIG. **1**, among operation buttons **14**A to **14**L, a cross button **14**A, a button **14**B, a button **14**C, a button **14**D, a button **14**E, a power button **14**F, a selection button **14**J, a HOME button **14**K, and a start button **14**L are provided on the inner side surface **11**B of the lower housing **11**. The buttons **14**A to **14**E, the selection button **14**J, the HOME button **14**K, and the start button **14**L are respectively assigned with functions in accordance with a program executed by the game apparatus **10**, as necessary. For example, the cross button **14**A is used for selection operation and the like, and the operation buttons **14**B to **14**E are used for, for example, determination operation and cancellation operation. The power button **14**F is used for powering the game apparatus **10** on/off.

The analog stick **15** is a device for indicating a direction, and is provided to the left of the lower LCD **12** on the inner side surface **11**B of the lower housing **11**. The analog stick **15** and the cross button **14**A are positioned so as to be operated by a thumb of the user's left hand holding the lower housing **11**. The analog stick **15** has a keytop that slides in parallel to the inner side surface **11**B of the lower housing **11**. The analog stick **15** serves as respective functions corresponding to programs executed by the game apparatus **10**.

The microphone hole **18** is provided on the inner side surface **11**B of the lower housing **11**. Though will be described later, a microphone **43** (see FIG. **4**) is provided, as a sound input device, inside the lower housing **11**, so as to correspond to the position of the microphone hole **18**. A sound inputted via the microphone hole **18** is detected by the microphone **43**.

As shown in FIGS. **3**B and **3**D, an L button **14**G and an R button **14**H are provided on the upper side surface of the lower housing **11**. The L button **14**G is positioned on the left end portion of the upper side surface of the lower housing **11** and the R button **14**H is positioned on the right end portion of the upper side surface of the lower housing **11**. The L button **14**G and the R button **14**H function as, for example, shutter buttons (photographing instruction buttons) of the imaging section. Further, as shown in FIG. **3** A, a sound volume button **14**I is provided on the left side surface of the lower housing **11**. The sound volume button **14**I is used for adjusting a sound volume of a speaker **44** (see FIG. **4**) of the game apparatus **10**.

As shown in FIG. **3**A, a cover section **11**C is provided on the left side surface of the lower housing **11** so as to be openable and closable. Inside the cover section **11**C, a connector (not shown) is provided for electrically connecting the game apparatus **10** to an external data storage memory **46** (see FIG. **1**). The external data storage memory **46** is detachably connected to the connector. The external data storage memory **46** is used for, for example, recording (storing) data of an image taken by the game apparatus **10**. The connector and the cover section **11**C may be provided on the right side surface of the lower housing **11**.

As shown in FIG. **3**D, an insertion opening **11**D is provided on the upper side surface of the lower housing **11**. An external memory **45** (see FIG. **1**) that is a storage medium having an information processing program stored therein is inserted into the insertion opening **11**D. A connector (not shown) for connecting the game apparatus **10** to the external memory **45** in a detachable manner is provided inside the insertion opening **11**D. The external memory **45** is attached to the connecter, whereby the external memory **45** and the game apparatus **10** are electrically connected, and then the information processing program is executed. It is noted that the connector and the insertion opening **11**D may be provided on another side surface (for example, the right side surface) of the lower housing **11**.

As shown in FIG. **1**, a first LED **16**A is provided on the lower side surface of the lower housing **11**. The first LED **16**A notifies a user of an ON/OFF state of a power supply of the game apparatus **10**. As shown in FIG. **3**C, a second LED **16**B is provided on the right side surface of the lower housing **11**. The game apparatus **10** is configured to allow wireless communication with other devices. The second LED **16**B notifies a user of an establishment state of a wireless communication of the game apparatus **10**, and lights up when the wireless communication is established

with another device. The game apparatus **10** has a function of connecting to a wireless LAN in a method based on, for example, IEEE802.11.b/g standard. A wireless switch **19** for enabling/disabling the function of the wireless communication is provided on the right side surface of the lower housing **11** (see FIG. **3**C).

[Configuration of Upper Housing **21**]

In the upper housing **21**, an upper LCD (Liquid Crystal Display) **22**, two outer imaging sections **23** (a outer left imaging section **23**A and a outer right imaging section **23**B), an inner imaging section **24**, a 3D adjustment switch **25**, and a 3D indicator **26** are provided.

As shown in FIG. **1**, the upper LCD **22** is provided on the inner side surface (main surface) **21**B of the upper housing **21**. The upper LCD **22** has a display screen whose length in the lateral direction is longer than the length in the longitudinal direction, and is provided at the center of the upper housing **21**. The number of pixels of the upper LCD **22** is, as one example, 800 dots×240 dots (the longitudinal line× the vertical line), which is not limited thereto. It is noted that although, in the exemplary embodiment, the upper LCD **22** is an LCD, a display device using an EL (Electro Luminescence), or the like may be used.

The upper LCD **22** is a display device capable of displaying a stereoscopically visible image. The upper LCD **22** can display an image for a left eye and an image for a right eye by using substantially the same display area.

As shown in FIG. **3**B, the outer imaging section **23** is provided on the outer side surface (the back surface reverse of the main surface on which the upper LCD **22** is provided) **21**D of the upper housing **21**. The outer imaging section **23** includes the outer left imaging section **23**A and the outer right imaging section **23**B.

The imaging directions of the outer left imaging section **23**A and the outer right imaging section **23**B are each the same as the outward normal direction of the outer side surface **21**D. In addition, the imaging direction of the outer left imaging section **23**A and the imaging direction of the outer right imaging section **23**B are parallel to each other. The outer left imaging section **23**A and the outer right imaging section **23**B can be used as a stereo camera depending on a program executed by the game apparatus **10**.

The inner imaging section **24** is provided on the inner side surface (main surface) **21**B of the upper housing **21**, and serves as an imaging section which takes an image in the direction opposite to that of the outer imaging section **23**. Thus, when a user views the upper LCD **22** from the front thereof, the inner imaging section **24** can take an image of the face of the user from the front thereof. The inner imaging section **24** includes an imaging device, such as a CCD image sensor or a CMOS image sensor, having a predetermined resolution, and a lens. The lens may have a zooming mechanism.

As shown in FIGS. **1**, **2**, and **3**C, a 3D adjustment switch **25** is provided at the end portions of the inner side surface and the right side surface of the upper housing **21**. The 3D adjustment switch **25** is used for adjusting the stereoscopic effect of a stereoscopically visible image (stereoscopic image) which is displayed on the upper LCD **22**.

As shown in FIG. **1**, the 3D indicator **26** is positioned on the inner side surface **21**B of the upper housing **21**. The 3D indicator **26** indicates whether or not the upper LCD **22** is in a stereoscopic display mode. The 3D indicator **26** is implemented as a LED, and is lit up when the stereoscopic display mode of the upper LCD **22** is enabled.

In addition, a speaker hole **21**E is provided on the inner side surface **21**B of the upper housing **21**. A sound is outputted through the speaker hole **21**E from a speaker **44** (see FIG. **4**) described later.

[Internal Configuration of Game Apparatus **10**]

Next, an internal configuration of the game apparatus **10** will be described with reference to FIG. **4**. FIG. **4** is a block diagram illustrating an example of an internal configuration of the game apparatus **10**.

As shown in FIG. **4**, the game apparatus **10** includes electronic components such as an information processing section **31**, a main memory **32**, an external memory interface (external memory I/F) **33**, an external data storage memory I/F **34**, an internal data storage memory **35**, a wireless communication module **36**, a local communication module **37**, a real-time clock (RTC) **38**, an acceleration sensor **39**, an angular velocity sensor **40**, a power supply circuit **41**, an interface circuit (I/F circuit) **42**, and the like. These electronic components are mounted on an electronic circuit substrate, and accommodated in the lower housing **11** (or the upper housing **21**).

The information processing section **31** is information processing means which includes a CPU (Central Processing Unit) **311** for executing a predetermined program, a GPU (Graphics Processing Unit) **312** for performing image processing, and the like. In the exemplary embodiment, an information processing program is stored in a memory (for example, the external memory **45** connected to the external memory I/F **33** or the internal data storage memory **35**) inside the game apparatus **10**. The CPU **311** performs information processing such as scrolling and displaying a scroll target image displayed on the display screen, by executing the information processing program. It is noted that the program executed by the CPU **311** may be obtained from another device through communication with the other device.

The information processing section **31** further includes a VRAM (Video RAM) **313**. The GPU **312** renders an image in the VRAM **313** in accordance with an instruction from the CPU **311**. The GPU **312** outputs the image rendered in the VRAM **313**, to the upper LCD **22** and/or the lower LCD **12**, and the image is displayed on the upper LCD **22** and/or the lower LCD **12**.

To the information processing section **31**, the main memory **32**, the external memory I/F **33**, the external data storage memory I/F **34**, and the internal data storage memory **35** are connected. The external memory I/F **33** is an interface for detachably connecting to the external memory **45**. The external data storage memory I/F **34** is an interface for detachably connecting to the external data storage memory **46**.

The main memory **32** is volatile storage means used as a work area and a buffer area for the CPU **311**. That is, the main memory **32** temporarily stores various types of data used for the image processing and the game processing, and temporarily stores a program obtained from the outside (the external memory **45**, another device, or the like), for example. In the exemplary embodiment, for example, a PSRAM (Pseudo-SRAM) is used as the main memory **32**.

The external memory **45** is nonvolatile storage means for storing a program executed by the information processing section **31**. The external memory **45** is implemented as, for example, a read-only semiconductor memory. When the external memory **45** is connected to the external memory I/F **33**, the information processing section **31** can load a program stored in the external memory **45**. A predetermined

process is performed by the program loaded by the information processing section **31** being executed.

The external data storage memory **46** is implemented as a non-volatile readable and writable memory (for example, a NAND flash memory), and is used for storing predetermined data. For example, images taken by the outer imaging section **23** and/or images taken by another device are stored in the external data storage memory **46**. When the external data storage memory **46** is connected to the external data storage memory I/F **34**, the information processing section **31** loads an image stored in the external data storage memory **46**, and the image can be displayed on the upper LCD **22** and/or the lower LCD **12**.

The internal data storage memory **35** is implemented as a non-volatile readable and writable memory (for example, a NAND flash memory), and is used for storing predetermined data. For example, data and/or programs downloaded through the wireless communication module **36** by wireless communication is stored in the internal data storage memory **35**.

The wireless communication module **36** has a function of connecting to a wireless LAN by using a method based on, for example, IEEE 802.11.b/g standard. The local communication module **37** has a function of performing wireless communication with the same type of game apparatus in a predetermined communication method (for example, infrared communication). The information processing section **31** can perform data transmission to and data reception from another device via the Internet by using the wireless communication module **36**, and can perform data transmission to and data reception from the same type of another game apparatus by using the local communication module **37**.

The acceleration sensor **39** detects magnitudes of accelerations (linear accelerations) in the directions of the straight lines along the three axial directions (xyz axial directions in the exemplary embodiment), respectively.

The angular velocity sensor **40** detects angular velocities generated around the three axes (xyz axes in the exemplary embodiment), respectively, of the game apparatus **10**, and outputs data representing the detected angular velocities (angular velocity data) to the information processing section **31**.

The RTC **38** and the power supply circuit **41** are connected to the information processing section **31**. The RTC **38** counts time, and outputs the time to the information processing section **31**. The information processing section **31** calculates a current time (date) based on the time counted by the RTC **38**. The power supply circuit **41** controls power from the power supply (the rechargeable battery accommodated in the lower housing **11**) of the game apparatus **10**, and supplies power to each component of the game apparatus **10**.

The microphone **43**, the speaker **44**, and the touch panel **13** are connected to the I/F circuit **42**. Specifically, the speaker **44** is connected to the I/F circuit **42** through an amplifier which is not shown. The microphone **43** detects a voice from a user, and outputs a sound signal to the I/F circuit **42**. The amplifier amplifies a sound signal outputted from the I/F circuit **42**, and a sound is outputted from the speaker **44**. The I/F circuit **42** includes a sound control circuit for controlling the microphone **43** and the speaker **44** (amplifier), and a touch panel control circuit for controlling the touch panel **13**. The sound control circuit performs A/D conversion and D/A conversion on the sound signal, and converts the sound signal to a predetermined form of sound data, for example. The touch panel control circuit generates a predetermined form of touch position data based on a signal outputted from the touch panel **13**, and outputs the touch position data to the information processing section **31**. The touch position data represents coordinates of a position, on an input surface of the touch panel **13**, on which an input is made (touch position). The touch panel control circuit reads a signal outputted from the touch panel **13**, and generates the touch position data every predetermined time. The information processing section **31** obtains the touch position data, to recognize a touch position on which an input is made on the touch panel **13**.

The operation button **14** includes the operation buttons **14**A to **14**L described above, and is connected to the information processing section **31**. Operation data representing an input state of each of the operation buttons **14**A to **141** is outputted from the operation button **14** to the information processing section **31**, and the input state indicates whether or not each of the operation buttons **14**A to **141** has been pressed. The information processing section **31** obtains the operation data from the operation button **14** to perform a process in accordance with the input on the operation button **14**.

A user selects the imaging section to be used by performing a predetermined operation using the touch panel **13** and the operation buttons **14**. In accordance with a result of the selection, the information processing section **31** instructs one of the outer imaging section **32** or the inner imaging section **24** to take an image. Whereas, the outer imaging section **23** and the inner imaging section **24** each take an image in accordance with an instruction from the information processing section **31**, and output data of the taken image to the information processing section **31**.

The lower LCD **12** and the upper LCD **22** each display an image in accordance with an instruction from the information processing section **31** (the GPU **312**). For example, the information processing section **31** displays, on the upper LCD **22**, a stereoscopic image (stereoscopically visible image) using an image for a right eye and an image for a left eye which are taken by the outer imaging section **23**. In addition, the information processing section **31** displays, on the lower LCD **12**, on a content selection screen including various images (icons) for starting predetermined programs. In addition, the information processing section **31** causes the lower LCD **12** to display, for example, various images (icons) for activating predetermined programs and an image (text) which is to be scrolled in accordance with an operation of the user. The configuration of the display screen of the lower LCD **12** will be described later in detail.

The 3D adjustment switch **25** outputs, to the information processing section **31**, an electrical signal in accordance with the position of the slider. Whereas, the information processing section **31** (CPU **311**) sets a display mode of the upper LCD **22**, based on an electric signal from the 3D adjustment switch **25**. The information processing section **31** controls whether or not the 3D indicator **26** is to be lit up. For example, the information processing section **31** lights up the 3D indicator **26** when the upper LCD **22** is in the stereoscopic display mode.

It is noted that the above-described configuration of hardware is merely an example, the configuration of the game apparatus **10** may be changed as appropriate.

[Configuration of Display Screen of Lower LCD **12**]

FIG. **5** is a diagram illustrating an example of the configuration of the display screen of the lower LCD **12** and an image displayed on the display screen. As shown in FIG. **5**, the display screen of the lower LCD **12** has a scroll image display region **51** for displaying a scroll target image. The scroll target image is an image (text) which is to be scrolled and displayed in the up-down direction (y-axis direction) in

the scroll image display region **51** in accordance with later-described various operations performed by the user. In addition, various images are also displayed in the region of the display screen of the lower LCD **12** other than the scroll image display region **51**. For example, an image of a software keyboard is displayed on the lower side of the scroll image display region **51**, and a scroll target image (text) is displayed in the scroll image display region **51** on the basis of information inputted by the user touching the software keyboard.

Meanwhile, the display screen of the lower LCD **12** is composed of a selection operation region **52**, an upper scroll instruction region **53**, and a lower scroll instruction region **54**. The upper scroll instruction region **53** is located on the upper side of the selection operation region **52**, and the lower scroll instruction region **54** is located on the lower side of the selection operation region **52**. The selection operation region **52** is a region for the user to perform a selection operation of selecting a part or the entirety of the scroll target image by using the touch pen **28**. The upper scroll instruction region **53** is a region for the user to scroll the scroll target image in the upward direction by using the touch pen **28**. The lower scroll instruction region **54** is a region for the user to scroll the scroll target image in the downward direction by using the touch pen **28**. It is noted that the selection operation region **52** is a region for performing the selection operation on the scroll target image and thus is included in the scroll image display region **51**.

[Various Operations by User]

Hereinafter, various operations in which the user touches the touch panel **13** by using the touch pen **28** will be described with reference to FIGS. **6** to **11**. In the following description, an operation in which the user touches the touch panel **13** by using the touch pen **28** is referred to as "touch-on", and an operation in which the user separates the touch pen **28** from the touch panel **13** is referred to as "touch-off". For the convenience of explanation, unless otherwise specified herein, a touch-on being performed by the user on the touch panel **13** located directly above the display screen of the lower LCD **12** is referred to merely as a touch-on being performed on the display screen of the lower LCD **12**. Similarly, a "touch position" on the touch panel **13** which is pointed by the touch pen **28** is referred to as "touch position" on the display screen of the lower LCD **12** located directly below the touch panel **13**. Moreover, an operation in which the user performs a touch-on on the selection operation region **52** by using the touch pen **28** and moves the touch position (without performing a touch-off) is referred to as drag operation.

[Selection Process]

FIG. **6** illustrates a situation where the user performs a touch-on on the selection operation region **52** in the display screen of the lower LCD **12**. As shown in FIG. **6**, when the user performs a drag operation in the selection operation region **52**, a part or the entirety of the scroll target image (text) displayed in the scroll image display region **51** is selected in accordance with the operation amount of the drag operation (the shift amount of the touch position). It is noted that when a touch-on is initially performed on the selection operation region **52**, a selection process in which the scroll target image is selected as described above, and a later-described scroll process in which the scroll target image is scrolled and displayed in the up-down direction, are performed. When a touch-on is not initially performed on the selection operation region **52**, neither the selection process nor the scroll process is performed even if the touch position shifts.

[Scroll Process]

FIGS. **7** to **12** illustrate situations where the user scrolls and displays the scroll target image displayed in the scroll image display region **51**.

[First Downward Scroll Process]

FIGS. **7** and **8** illustrate a situation where the user drags the touch pen **28** in the downward direction to scroll and display the scroll target image in the downward direction. As shown in FIG. **7**, the user initially performs a touch-on on the selection operation region **52** by using the touch pen **28**, and then drags the touch pen **28** in the downward direction to move the touch position onto the lower scroll instruction region **54**. At that time, as shown in FIG. **8**, the scroll target image displayed in the scroll image display region **51** is scrolled and displayed in the downward direction (i.e., the scroll target image relatively moves with respect to the scroll image display region **51** in the upward direction). It is noted that the speed of scrolling is set, for example, in accordance with a shift amount by which the touch position on the lower scroll instruction region **54** has shifted from the lower edge of the selection operation region **52** (the boundary between the selection operation region **52** and the lower scroll instruction region **54**) in the downward direction (in the y-axis negative direction).

[First Upward Scroll Process]

FIGS. **9** and **10** illustrate a situation where the user drags the touch pen **28** in the upward direction to scroll and display the scroll target image in the upward direction. As shown in FIG. **9**, the user initially performs a touch-on on the selection operation region **52** by using the touch pen **28**, and then drags the touch pen **28** in the upward direction to move the touch position onto the upper scroll instruction region **53**. At that time, the scroll target image displayed in the scroll image display region **51** is not scrolled and displayed in the upward direction due to the touch position being shifted from the selection operation region **52** onto the upper scroll instruction region **53** in the upward direction (the y-axis positive direction).

As shown in FIG. **10**, when the user moves the touch position onto the upper scroll instruction region **53** and keeps the touch position on the upper scroll instruction region **53** for a predetermined time (a long pressing operation), the scroll target image is scrolled and displayed in the upward direction (i.e., the scroll target image relatively moves with respect to the scroll image display region **51** in the downward direction). However, the touch position does not have to be fixed at a single point on the upper scroll instruction region **53** but suffices to be located at any position on the upper scroll instruction region **53**, and the time for which the touch position is located on the upper scroll instruction region **53** is counted as a time for which a long pressing operation is performed. It is noted that the speed of scrolling is set, for example, in accordance with the time for which the touch position is located on the upper scroll instruction region **53** (the time for which a long pressing operation is performed).

The reason why the operations performed by the user for the upward scroll process and the downward scroll process are different from each other as described above is as follows. Specifically, as exemplified in the exemplary embodiment, when the image of the software keyboard has to be displayed on the lower portion of the display screen of the lower LCD **12**, the scroll image display region **51** is located in the upper portion of the display screen of the lower LCD **12**. In this case, the length (width), in the upward direction, of the upper scroll instruction region **53** located on the upper side of the selection operation region **52** located in

the scroll image display region **51** is shorter than the length (width), in the downward direction, of the lower scroll instruction region **54** located on the lower side of the selection operation region **52**. Thus, a range where a drag operation is possible in the upward direction on the upper scroll instruction region **53** is smaller than a range where a drag operation is possible in the downward direction on the lower scroll instruction region **54**, and hence it is more difficult to perform a drag operation in the upward direction on the upper scroll instruction region **53** than a drag operation in the downward direction on the lower scroll instruction region **54**.

Further, a maximum value of a shift amount by which a touch position on the upper scroll instruction region **53** can shift from the upper edge of the selection operation region **52** (the boundary between the selection operation region **52** and the upper scroll instruction region **53** in the upward direction (y-axis positive direction) is smaller than a maximum value of a shift amount by which a touch position on the lower scroll instruction region **54** can shift from the lower edge of the selection operation region **52** (the boundary between the selection operation region **52** and the lower scroll instruction region **54**) in the downward direction (y-axis negative direction). Thus, when upward scroll display is performed in accordance with an operation that is the same as the operation for performing downward scroll display in which the speed of scrolling is set in accordance with the shift amount (see FIGS. **7** and **8**), the shift amount in the upward direction can be a small value, and hence the speed of scrolling in the upward direction is lower than the speed of scrolling in the downward direction. Meanwhile, in order to make the maximum value of the speed of scrolling in the upward direction equal to the maximum value of the speed of scrolling in the downward direction by the above same operation, a rate of increase in speed with respect to a certain shift amount has to be increased. In this case, change of the speed of scrolling is rapid with respect to movement (change) of the touch position, and the operability of the user deteriorates. Due to this reason, the upward scroll process is performed in accordance with an operation (long pressing operation) different from that for the downward scroll process.

[Second Upward Scroll Process]

FIG. **11** illustrates a situation where the user drags the touch pen **28** in the right-left direction to scroll and display the scroll target image in the upward direction. The user initially performs a touch-on on the selection operation region **52** by using the touch pen **28**, and then drags the touch pen **28** in the upward direction to move the touch position onto the upper scroll instruction region **53** (see FIG. **9**). Then, the user drags the touch pen **28** on the upper scroll instruction region **53** in the right-left direction (see FIG. **11**). At that time, as shown in FIG. **11**, the scroll target image displayed in the scroll image display region **51** is scrolled and displayed in the upward direction. It is noted that the speed of scrolling is set, for example, in accordance with the operation amount (distance) and speed of the drag operation.

The reason why the second upward scroll process is performed as described above is as follows. As described above, the first upward scroll process is performed when the user initially performs a touch-on on the selection operation region **52**, moves the touch position onto the upper scroll instruction region **53**, and then keeps the touch position on the upper scroll instruction region **53** for a predetermined time (a long pressing operation). Thus, when the user desires to immediately perform upward scroll display, waiting for elapse of the predetermined time is against the user's intention, and hence the user may feel discomfort. In addition, since a time of a long pressing operation has to be long (i.e., the user has to wait) in order for the user to increase the speed of scroll display, an operation that contradicts the user's intention to quickly (fast) perform scroll display has to be performed, and this may increase user's discomfort.

However, according to the second upward scroll process, upward scroll display can be performed in accordance with a drag operation being performed in the right-left direction on a region, in the upper scroll instruction region **53**, which extends in the right-left direction and in which a range where a drag operation is possible is wider in the right-left direction than in the up-down direction. Thus, the user can change the speed of scroll display in the upward direction by a drag operation in the right-left direction, and can cause upward scroll display to be performed without waiting for elapse of the predetermined time. As a result, upward scroll display can be performed when the user performs a long pressing operation on the upper scroll instruction region **53** or performs a drag operation on the upper scroll instruction region **53** in the right-left direction by using the touch pen **28**, and the operability for scroll display improves.

Further, the reason why the second upward scroll process is performed is also as follows. As exemplified in the exemplary embodiment, when the scroll image display region **51** is located at the upper edge of the display screen of the lower LCD **12**, the upper scroll instruction region **53** has to be provided in the scroll image display region **51**. Thus, the length (width) of the upper scroll instruction region **53** in the upward direction (scrolling direction) is short. However, the length (width) of the upper scroll instruction region **53** in the right-left direction can be lengthened even in the scroll image display region **51** as compared to the length thereof in the up-down direction. Therefore, the scroll target image can be scrolled and displayed in the upward direction in accordance with a drag operation being performed in the right-left direction on the upper scroll instruction region **53** for which a limited region in the scroll image display region **51** is used and which is long in the right-left direction.

In other words, according to the second upward scroll process, even when the proportion of the scroll image display region **51** in the lower LCD **12** cannot be increased such that the area in which the upper scroll instruction region **53** is located has a sufficient length in the scrolling direction (up-down direction), upward scroll display can be performed in accordance with a drag operation being performed on a region extending in a direction (the right-left direction) different from the scrolling direction. Due to this, even when the size of the scroll image display region **51** is increased in the lower LCD **12**, the scroll target image displayed in the scroll image display region **51** can appropriately be scrolled and displayed with good operability.

[Second Downward Scroll Process]

FIG. **12** illustrates a situation where the user drags the touch pen **28** in the right-left direction to scroll and display the scroll target image in the downward direction. The user initially performs a touch-on on the selection operation region **52** by using the touch pen **28**, and then drags the touch pen **28** in the downward direction to move the touch position onto the lower scroll instruction region **54** (see FIG. **7**). At that time, as shown in FIG. **8**, the scroll target image is scrolled and displayed in the downward direction at a speed corresponding to the operation amount (distance) of the drag operation in the downward direction. Further, the user drags the touch pen **28** on the lower scroll instruction region **54** in the right-left direction (see FIG. **12**). At that

time, as shown in FIG. **12**, the scroll target image is scrolled and displayed in the downward direction at a higher speed. It is noted that the amount of increase in the speed of scrolling is set, for example, in accordance with the operation amount (distance) and speed of the drag operation in the right-left direction shown in FIG. **12**.

The reason why the second downward scroll process is performed as described above is as follows. As described above, the first downward scroll process (see FIG. **8**) is performed when the user initially performs a touch-on on the selection operation region **52** and moves the touch position onto the lower scroll instruction region **54**, and the speed of scroll display is set in accordance with the shift amount of the touch position in the downward direction. However, the maximum value of the shift amount in the downward direction is the amount of shift to the lower edge of the lower scroll instruction region **54**, and thus the speed of scroll display that is set in accordance with the shift amount has a limit. However, depending on the user or the size (the length in the up-down direction) of the scroll target image, it is desired to perform scroll display at a higher speed.

In such a case, when, in addition to the normal first downward scroll process (see FIG. **8**), the second downward scroll process (see FIG. **12**) is performed, the user can cause the scroll target image to be scrolled and displayed in the downward direction at a higher speed. Therefore, the user who desires to perform scroll display in the downward direction at a high speed performs a normal drag operation in the downward direction as well as a drag operation in the right-left direction, whereby scroll display can be performed in the downward direction at an intended speed.

As described above, when the user initially performs a touch-on on the selection operation region **52**, selection display of selecting a part or the entirety of the scroll target image displayed in the scroll image display region **51**, upward scroll display of the scroll target image, and downward scroll display of the scroll target image can be performed. In addition, upward scroll display of the scroll target image can be performed in accordance with a long pressing operation with the touch pen **28** and a drag operation with the touch pen **28** in the right-left direction. Downward scroll display of the scroll target image can be performed in accordance with a drag operation with the touch pen **28** in the downward direction (into the lower scroll instruction region **54**) and a drag operation with the touch pen **28** in the right-left direction. Therefore, the flexibility in the operation for scroll display is increased for the user, and the operation for scroll display in the upward direction is possible regardless of the position and the size of the upper scroll instruction region **53** constrained by the position and the size of the scroll image display region **51** within the lower LCD **12**.

[Memory Map]

Hereinafter, data that is stored in the main memory **32** when information processing is performed will be described with reference to FIG. **13**. FIG. **13** is a memory map of the main memory **32**. As exemplified in FIG. **13**, the main memory **32** includes a program storage area **321** and a data storage area **323**. In the program storage area **321**, programs executed by the CPU **311** are stored. In the data storage area **323**, various data used for the information processing is stored. The programs in the program storage area **321** and a part of data in the data storage area **323** are data which is previously stored in the external memory **45** or the like and is read out from the external memory **45** or the like when the information processing is performed.

In the program storage area **321**, an information processing program **322** and the like are stored. The information processing program **322** is a program for causing the CPU **311** to perform a series of processes shown in FIGS. **14** to **16**.

In the data storage area **323**, touch position data **324**, timer counter data **325**, x-axis drag determination threshold data **326**, timer scroll determination threshold data **327**, and the like are stored.

The touch position data **324** indicates a touch position on the display screen of the lower LCD **12** by the touch pen **28**. In the exemplary embodiment, the touch position is represented by a two-dimensional coordinate (x, y) for which the longitudinal direction of the screen of the lower LCD **12** shown in FIG. **5** is defined as an x-axis direction and a direction perpendicular to the x-axis direction is defined as a y-axis direction. When a touch-on is performed on the display screen of the lower LCD **12**, touch position data (A(**1**), A(**2**), . . . , A(n)) including initial touch position data A(**1**) to latest nth touch position data A(n) is continuously stored as the touch position data **324** in the data storage area **323** every predetermined time.

In other words, while user continuously performs a touch-on on the display screen of the lower LCD **12**, a track of the touch position is stored as the touch position data **324** in the data storage area **323**. On the basis of the latest touch position data A(n) indicated by the touch position data **324**, for example, a process of determining whether or not a touch-on is performed on the selection operation region **52** with the touch pen **28**, or the like, is performed. It is noted that when a touch-off is performed, all the touch position data **324** is reset (initialized).

The timer counter data **325** indicates a time of which measurement is started when a touch-on is initially performed on the selection operation region **52** with the touch pen **28** and the touch position moves from the selection operation region **52** onto the upper scroll instruction region **53**. Then, the time is stored as the timer counter data **325** in the data storage area **323** while the touch position is located on the upper scroll instruction region **53**. It is noted that the timer counter data **325** is reset (initialized) when the touch position is located out of the upper scroll instruction region **53**.

The x-axis drag determination threshold data **326** is data of a threshold used for determining whether or not a drag operation of the user with the touch pen **28** in the right-left direction can be regarded as an instruction to scroll and display a scroll target image. Specifically, the x-axis drag determination threshold data **326** is data of a threshold for determining whether or not a shift of a touch position in the upper scroll instruction region **53** or the lower scroll instruction region **54** after a touch-on is initially performed on the selection operation region **52** with the touch pen **28** and then the touch position moves from the selection operation region **52** onto the upper scroll instruction region **53** or the lower scroll instruction region **54** can be regarded as an instruction to scroll and display a scroll target image. This data is intended to exclude a shift caused by unintentional hand movement of the user, and an arbitrary value is set to this data. For example, when a shift caused by unintentional hand movement of the user does not have to be taken into consideration, the value suffices to be set to 0 (zero).

Further, when the speed of scrolling is changed in accordance with a shift amount of a touch position in the right-left direction, the x-axis drag determination threshold data **326** is also used as a threshold for selecting a speed of scrolling. For example, when: data X**0** of the x-axis drag determination threshold data **326** is used as a determination value based on which it is regarded as an instruction for scroll display; and

data X1 thereof is used as a threshold for a speed Va of scrolling, a speed V of scrolling is set to Va if the value of a shift amount of a touch position in the right-left direction is equal to or greater than X0 but less than X1, and the speed V of scrolling is set to Vb (an upper limit) if the value of the shift amount is equal to or greater than X1. When a speed of scrolling is set to a speed corresponding to a shift amount of a touch position in the right-left direction as described above, a plurality of thresholds corresponding to speeds, respectively, can also be stored as the x-axis drag determination threshold data **326** in the data storage area **323**. In this case, the speeds Va and Vb of scrolling and the like are stored as speed data (not shown) in the data storage area **323**.

The timer scroll determination threshold data **327** is data of a threshold used for determining whether or not the time of which measurement is started and which is indicated by the timer counter data **325** exceeds a predetermined time. Specifically, the timer scroll determination threshold data **327** is data of a threshold for determining whether or not it can be regarded as an instruction to scroll and display a scroll target image, on the basis of a time for which a touch position is located on the upper scroll instruction region **53** after a touch-on is initially performed on the selection operation region **52** with the touch pen **28** and then the touch position moves from the selection operation region **52** onto the upper scroll instruction region **53**.

Further, when a speed of scrolling is changed in accordance with a time for which a touch position is located on the upper scroll instruction region **53**, the timer scroll determination threshold data **327** is also used as a threshold for selecting a speed of scrolling. For example, when: data T0 of the timer scroll determination threshold data **327** is used as a determination value based on which it is regarded as an instruction for scroll display; and data T1 thereof is used as a threshold for a speed Va of scrolling, a speed V of scrolling is set to Va if a value T of the timer counter data **325** is equal to or greater than T0 but less than T1, and the speed V of scrolling is set to Vb (an upper limit) if the value T of the timer counter data **325** is equal to or greater than T1. When a speed of scrolling is set to a speed corresponding to a time of a long pressing operation as described above, a plurality of thresholds corresponding to speeds, respectively, can also be stored as the timer scroll determination threshold data **327** in the data storage area **323**.

[Processes Performed by CPU **311**]

Next, a selection process and a scroll process performed by the CPU **311** will be described with reference to flowcharts of FIGS. **14** to **16**. It is noted that a series of processes described below is performed by the CPU **311** or in accordance with instructions issued by the CPU **311**, on the basis of the information processing program **322** stored in the main memory **32**. In addition, in these flowcharts, processes regarding generation and output of an image are omitted, but generation and output of an image is performed in constant cycles.

As shown in FIG. **14**, first, at step S**11**, the CPU **311** determines whether or not a touch-on has been performed on the display screen of the lower LCD **12**. When a result of the determination at step S**11** is YES, the processing proceeds to step S**12**, and when the result of the determination is NO, the processing returns to step S**11**. In other words, when a touch-on has not been performed on the display screen of the lower LCD **12**, the CPU **311** repeats the determination at step S**11** until it is determined that a touch-on has been performed.

At step S**12**, the CPU **311** detects the initial touch position at which the touch-on is determined at step S**11** to have been performed on the display screen of the lower LCD **12**. Specifically, the CPU **311** detects the touch position on the basis of the initial touch position data A(**1**) of the touch position data **324** stored in the data storage area **323**. Then, the processing proceeds to step S**13**.

At step S**13**, the CPU **311** determines whether or not the initial touch position detected at step S**12** is on the selection operation region **52**. When a result of the determination at step S**13** is YES, the processing proceeds to step S**15**, and when the result of the determination is NO, the processing proceeds to step S**14**.

At step S**14**, the CPU **311** determines whether or not a touch-off has been performed on the display screen of the lower LCD **12** with the touch pen **28**. When a result of the determination at step S**14** is YES, the processing returns to step S**11**, and when the result of the determination is NO, the processing returns to step S**14**. In other words, the CPU **311** repeats the determination at step S**14** until it is determined that a touch-off has been performed, and the processing returns to step S**11** when it is determined that a touch-off has been performed.

In other words, when the initial touch position is detected (step S**12**) and this touch position is not on the selection operation region **52** (step S**13**: NO), the selection process and the scroll process are not performed even if the touch-on is continuously performed on the display screen of the lower LCD **12** later. Thus, the CPU **311** waits for a touch-off being performed on the display screen of the lower LCD **12** with the touch pen **28**.

At step S**15**, the CPU **311** detects the next touch position. Specifically, the CPU **311** detects the next touch position on the basis of the latest touch position data A(n) of the touch position data **324** stored in the data storage area **323**. Then, the processing proceeds to step S**16**.

At step S**16**, the CPU **311** determines whether or not the next touch position detected at step S**15** is on the selection operation region **52**. When a result of the determination at step S**16** is YES, the processing proceeds to step S**17**, and when the result of the determination is NO, the processing proceeds to step S**23**.

In other words, when the initial touch position is on the selection operation region **52** (step S**13**: YES), it is determined whether the selection process is to be performed, the scroll process is to be performed, or neither the selection process nor the scroll process is to be performed, on the basis of where the touch position moves later (on the basis of where the next touch position is detected). Thus, at step S**16**, it is determined which region the next touch position is located in the display screen of the lower LCD **12**.

At step S**17**, the CPU **311** determines whether or not a timer counter is in operation, on the basis of the timer counter data **325** stored in the data storage area **323**. When a result of the determination at step S**17** is YES, the processing proceeds to step S**18**, and when the result of the determination is NO, the processing proceeds to step S**19**.

At step S**18**, the CPU **311** stops the operation of the timer counter. Specifically, the CPU **311** stops measurement of the timer counter which is conducting the measurement, and resets (initializes) the timer counter data **325**.

The reason why the operation of the timer counter is stopped (step S**18**) when the timer counter is in operation (step S**17**: YES) as described above is as follows. Specifically, the timer counter operates when a touch position is located on the upper scroll instruction region **53** in an upper portion operation process (see FIG. **16**) described later, and the timer counter measures a time for which the touch position is continuously located on the upper scroll instruc-

tion region **53**. Thus, when the touch position moves onto the selection operation region **52** (when the touch position is detected on the selection operation region **52**), the measured time is reset and the operation of the timer counter stops.

At step S**19**, the CPU **311** determines whether or not a shift of the touch position corresponds to a selection operation. Specifically, the CPU **311** calculates a shift of the touch position from the latest touch position data A(n) and immediately previous touch position data A (n−1) of the touch position data **324** stored in the data storage area **323**, and determines whether or not the shift is a shift corresponding to a selection operation. When a result of the determination at step S**19** is YES, the processing proceeds to step S**20**, and when the result of the determination is NO, the processing proceeds to step S**21**.

At step S**20**, on the basis of the shift of the touch position calculated at step S**19**, the CPU **311** performs a selection process corresponding to the shift amount. Specifically, the CPU **311** selects a part (or the entirety) of an image corresponding to a region corresponding to the shift amount, from a scroll target image displayed in the scroll image display region **51**, and highlights the selected image (see FIG. **6**). Then, the processing proceeds to step S**21**.

At step S**21**, the CPU **311** determines whether or not a touch-off has been performed on the display screen of the lower LCD **12** with the touch pen **28**. When a result of the determination at step S**21** is YES, the processing proceeds to step S**22**, and when the result of the determination is NO, the processing returns to step S**15**. In other words, as long as the touch-on is performed on the display screen of the lower LCD **12**, the latest touch position is continuously detected.

At step S**22**, the CPU **311** resets the touch position data **324**. In other words, when a touch-off has been performed on the display screen of the lower LCD **12** with the touch pen **28** (step S**21**: YES), the touch position data **324** is reset (initialized). Then, the processing returns to step S**11**.

At step S**23**, the CPU **311** determines whether or not the touch position is on the lower scroll instruction region **54**. When a result of the determination at step S**23** is YES, the processing proceeds to a lower portion operation process (see FIG. **15**). When the result of the determination is NO (i.e., when the touch position is on the upper scroll instruction region **53**), the processing proceeds to the upper portion operation process (see FIG. **16**).

Next, the lower portion operation process performed by the CPU **311** will be described with reference to FIG. **15**.

First, at step S**31**, the CPU **311** calculates a first speed V**1** of scrolling in the downward direction on the basis of the y coordinate of the touch position that is detected at step S**15** (see FIG. **14**) and is determined at step S**23** (see FIG. **14**) to be located on the lower scroll instruction region **54** (step S**23**: YES). Specifically, the CPU **311** calculates a shift amount by which the touch position has shifted from the lower edge of the selection operation region **52** (the boundary between the selection operation region **52** and the lower scroll instruction region **54**) in the y-axis negative direction (downward direction), on the basis of the y coordinate of the latest touch position data A(n) of the touch position data **324** stored in the data storage area **323**. Then, the CPU **311** calculates the first speed V**1** on the basis of the shift amount. For example, settings may be made such that the speed V**1** increases in proportion to the shift amount, or a certain speed may be caused to correspond to each range of the shift amount. Then, the processing proceeds to step S**32**.

At step S**32**, the CPU **311** determines whether or not a shift of the touch position in the x-axis direction exceeds a predetermined threshold. Specifically, the CPU **311** calculates a shift amount of the touch position in the x-axis direction from the x coordinate of the latest touch position data A(n) and the x coordinate of the immediately previous touch position data A(n−1) of the touch position data **324** stored in the data storage area **323**, and determines whether or not the shift amount exceeds the value of the x-axis drag determination threshold data **326** stored in the data storage area **323**. When a result of the determination at step S**32** is YES, the processing proceeds to step S**33**, and when the result of the determination is NO, the processing proceeds to step S**34**.

At step S**33**, the CPU **311** calculates a second speed V**2** of scrolling in the downward direction on the basis of the shift amount of the touch position in the x-axis direction that is determined at step S**32** to exceed the threshold (step S**32**: YES). For example, settings may be made such the speed V**2** increases in proportion to the shift amount, or a certain speed may be caused to correspond to each range of the shift amount. Then, the processing proceeds to step S**35**.

At step S**34**, the CPU **311** sets a value 0 as the second speed V**2** of scrolling in the downward direction, since it is determined at step S**32** that the shift amount of the touch position in the x-axis direction does not exceed the threshold (step S**32**: NO). Then, the processing proceeds to step S**35**.

At step S**35**, the CPU **311** adds the first speed V**1** calculated at step S**31** and the second speed V**2** calculated at step S**33** or S**34**, to calculate a speed V of scrolling in the downward direction. Then, the processing proceeds to step S**36**.

At step S**36**, the CPU **311** scrolls and displays the scroll target image displayed in the scroll image display region **51**, in the downward direction at the speed V calculated at step S**36**. Then, the processing proceeds to step S**37**.

At step S**37**, the CPU **311** determines whether or not a touch-off has been performed on the display screen of the lower LCD **12** with the touch pen **28**. When a result of the determination at step S**37** is YES, the processing proceeds to step S**38**, and when the result of the determination is NO, the processing returns to step S**15** (see FIG. **14**). In other words, as long as the touch-on is performed on the display screen of the lower LCD **12**, the latest touch position is continuously detected.

At step S**38**, the CPU **311** resets the touch position data **324**. In other words, when a touch-off has been performed on the display screen of the lower LCD **12** with the touch pen **28** (step S**37**: YES), the touch position data **324** is reset (initialized). Then, the processing returns to step S**11** in FIG. **14**.

As described above, in the lower portion operation process, the first speed V**1** is set in accordance with the position of the touch position in the up-down direction (y-axis direction), the second speed V**2** is set in accordance with the shift amount of the touch position in the right-left direction (x-axis direction), and the sum (V**1**+V**2**) of these speeds is set as the speed V of scrolling in the downward direction.

Next, the upper portion operation process performed by the CPU **311** will be described with reference to FIG. **16**.

First, at step. S**51**, the CPU **311** determines whether or not the timer counter is in operation, on the basis of the timer counter data **325** stored in the data storage area **323**. When a result of the determination at step S**51** is YES, the processing proceeds to step S**53**, and when the result of the determination is NO, the processing proceeds to step S**52**.

At step S**52**, the CPU **311** starts an operation of the timer counter. Specifically, the CPU **311** starts measurement of the timer counter, and stores the measured time as the timer

counter data **325** in the data storage area **323**. Then, the processing proceeds to step S**55**.

At step S**53**, the CPU **311** determines whether or not a value T of the timer counter exceeds a predetermined threshold. Specifically, the CPU **311** determines whether or not the timer counter data **325** stored in the data storage area **323** exceeds the value of the timer scroll determination threshold data **327** stored in the data storage area **323**. When a result of the determination at step S**53** is YES, the processing proceeds to step S**54**, and when the result of the determination is NO, the processing proceeds to step S**55**.

At step S**54**, the CPU **311** calculates a first speed V**1** of scrolling in the upward direction on the basis of the value T of the timer counter that is determined at step S**53** to exceed the threshold (step S**53**: YES). For example, settings may be made such that the speed V**1** increases in proportion to the magnitude of the value T, or a certain speed may be caused to correspond to each range of the value T. Then, the processing proceeds to step S**56**.

At step S**55**, the CPU **311** sets a value 0 as the first speed V**1** of scrolling in the upward direction, since it is immediately after the operation of the timer counter is started (step S**52**) or since the value T of the timer counter does not exceed the predetermined threshold (step S**53**: NO). Then, the processing proceeds to step S**56**.

At step S**56**, the CPU **311** determines whether or not a shift of the touch position in the x-axis direction exceeds a predetermined threshold. Specifically, the CPU **311** calculates a shift amount of the touch position in the x-axis direction from the x coordinate of the latest touch position data A(n) and the x coordinate of the immediately previous touch position data A (n−1) of the touch position data **324** stored in the data storage area **323**, and determines whether or not the shift amount exceeds the value of the x-axis drag determination threshold data **326** stored in the data storage area **323**. When a result of the determination at step S**56** is YES, the processing proceeds to step S**57**, and when the result of the determination is NO, the processing proceeds to step S**58**.

At step S**57**, the CPU **311** calculates a second speed V**2** of scrolling in the upward direction on the basis of the shift amount of the touch position in the x-axis direction that is determined at step S**56** to exceed the threshold (step S**56**: YES). For example, settings may be made such that the speed V**2** increases in proportion to the shift amount, or a certain speed may be caused to correspond to each range of the shift amount. Then, the processing proceeds to step S**59**.

At step S**58**, the CPU **311** sets a value 0 as the second speed V**2** of scrolling in the upward direction, since it is determined at step S**56** that the shift amount of the touch position in the x-axis direction does not exceed the threshold (step S**56**: NO).

At step S**59**, the CPU **311** adds the first speed V**1** calculated at step S**54** or S**55** and the second speed V**2** calculated at step S**57** or S**58**, to calculate a speed V of scrolling in the upward direction. Then, the processing proceeds to step S**60**.

At step S**60**, the CPU **311** scrolls and displays the scroll target image displayed in the scroll image display region **51**, in the upward direction at the speed V calculated at step S**59**. Then, the processing proceeds to step S**61**.

At step S**61**, the CPU **311** determines whether or not a touch-off has been performed on the display screen of the lower LCD **12** with the touch pen **28**. When a result of the determination at step S**61** is YES, the processing proceeds to step S**62**, and when the result of the determination is NO, the processing returns to step S**15** (see FIG. **14**). In other words, as long as the touch-on is performed on the display screen of the lower LCD **12**, the latest touch position is continuously detected.

At step S**62**, the CPU **311** stops the operation of the timer counter. Specifically, the CPU **311** stops the measurement of the timer counter which is conducting the measurement, and rests (initializes) the timer counter data **325**.

At step S**63**, the CPU **311** resets the touch position data **324**. In other words, when a touch-off has been performed on the display screen of the lower LCD **12** (step S**61**: YES), the touch position data **324** is reset (initialized). Then, the processing returns to step S**11** in FIG. **14**.

As described above, in the upper portion operation process, the first speed V**1** is set in accordance with the time for which the touch position exists (the time for which a long pressing operation is performed), the second speed V**2** is set in accordance with the shift amount of the touch position in the right-left direction (x-axis direction), and the sum (V**1**+V**2**) of these speeds is set as the speed V of scrolling in the upward direction.

As described above, the CPU **311** determines whether or not a position at which a touch-on is initially performed is on the selection operation region **52** (steps S**11** to S**13**), and when the position is on the selection operation region **52**, the CPU **311** determines the subsequent touch position (steps S**16** and S**23**), and performs the selection process (steps S**17** to S**22**), the lower portion operation process (steps S**31** to S**38**), and the upper portion operation process (steps S**51** to S**63**) in accordance with the result of the determination.

When it is determined that the next touch position (latest touch position) is on the selection operation region **52** (step S**16**: YES), the selection process is performed in which a part (or the entirety) of the scroll target image is selected in accordance with the shift amount of the touch position (steps S**19** and S**20**). In the exemplary embodiments disclosed herein, the selection process is not a principal part, and thus the detailed description thereof is omitted. Normally, after the selection process, a predetermined program is activated for the selected scroll target image.

When it is determined that the next touch position (latest touch position) is on the lower scroll instruction region **54** (step S**23**: YES), scroll display is performed in the downward direction (steps S**31** to S**36**). The speed of scrolling in this scroll display is the sum of: the first speed V**1** that is set in accordance with the position of the touch position in the up-down direction (y-axis direction) (step S**31**); and the second speed V**2** that is set in accordance with the shift amount of the touch position in the right-left direction (x-axis direction) (steps S**33** and S**34**). Therefore, the user can cause scroll display to be performed at the speed V**1** only by moving the touch pen **28** in the downward direction to shift the touch position onto the lower scroll instruction region **54**. In addition, when performing scroll display at a higher speed, the user can cause scroll display to be performed at the speed V**1**+V**2** only by moving (dragging) the touch pen **28** on the lower scroll instruction region **54** in the right-left direction.

When it is determined that the next touch position (latest touch position) is on the upper scroll instruction region **53** (step S**23**: NO), scroll display is performed in the upward direction (steps S**51** to S**60**). The speed of scrolling in this scroll display is the sum of: the first speed V**1** that is set in accordance with the time for which the touch position is located on the upper scroll instruction region **53** (steps S**54** and S**55**); and the second speed V**2** that is set in accordance with the shift amount of the touch position in the right-left direction (x-axis direction) (steps S**57** and S**58**). Therefore,

display scroll can be performed at the speed V1 when the user moves the touch pen **28** in the upward direction to locate the touch position on the upper scroll instruction region **53** and waits for elapse of the predetermined time. In addition, when performing scroll display at a higher speed, the user can cause scroll display to be performed at the speed V1+V2 by moving the touch pen **28** on the upper scroll instruction region **53** in the right-left direction. Moreover, when the user does not desire to wait for elapse of the predetermined time, the user can cause scroll display to be performed at the speed V2 by immediately moving the touch pen **28** on the upper scroll instruction region **53** in the right-left direction. It is noted that in this case, scroll display is performed at the speed V2+V1 when the touch pen **28** is continuously moved in the right-left direction for a predetermined time.

[Modifications]

In the embodiment described above, when the touch position moves on the upper scroll instruction region **53** in the right-left direction (x-axis direction) after a touch-on is initially performed on the selection operation region **52** and the touch position moves from the selection operation region **52** onto the upper scroll instruction region **53**, scroll display is performed in the upward direction (y-axis positive direction). However, when a touch-on is initially performed on the upper scroll instruction region **53** and the touch position moves on the upper scroll instruction region **53** in the right-left direction, scroll display may be performed in the upward direction.

Further, in the embodiment described above, in the upward scroll process, the speed of scrolling is set to the sum of the first speed V1 and the second speed V2. However, the speed of scrolling may be set to only the second speed V2. In other words, scroll display may be performed when the touch pen **28** is moved on the upper scroll instruction region **53** in the right-left direction. In this case as well, the user can cause scroll display to immediately be performed at a desired speed in the upward direction, by adjusting the shift amount of the touch pen **28** in the right-left direction.

Further, in the embodiment described above, as an example, the case has been described where the scroll image display region **51** extends to the upper edge of the display screen of the lower LCD **12** and thus the length of the upper scroll instruction region **53** in the scrolling direction (upward direction) is short. However, the scroll image display region **51** may extend also in the lower portion of the display screen of the lower LCD **12**, and thus the length of the lower scroll instruction region **54** in the scrolling direction (downward direction) may be shortened. In this case, the speed V1 may not be calculated from the magnitude of the shift amount by which the touch position has shifted from the lower edge of the selection operation region **52** (the boundary between the selection operation region **52** and the lower scroll instruction region **54**) in the y-axis negative direction (downward direction), and only the second speed V2 of scrolling in the downward direction may be calculated on the basis of the shift amount of the touch position in the x-axis direction (right-left direction).

Further, in the embodiment described above, as in a case where the scroll image display region **51** occupies the entirety (or substantially the entirety) of the display screen of the lower LCD **12**, both the length of the upper scroll instruction region **53** in the scrolling direction (upward direction) and the length of the lower scroll instruction region **54** in the scrolling direction (downward direction) may be short. In such a case as well, the speed of scrolling in the upward direction and the speed of scrolling in the downward direction are calculated on the basis of the shift amount of the touch position in the right-left direction. Therefore, even in the case where the scroll image display region **51** occupies the entirety (or substantially the entirety) of the display screen of the lower LCD **12**, scroll display can be performed in the up-down direction.

Further, in the embodiment described above, the shift amount of the touch position in the right-left direction (x-axis direction) is based on the shift amount in x coordinate between the latest touch position data A(n) and the immediately previous touch position data A(n−1) (see step S33 in FIG. **15** and step S57 in FIG. **16**). In other words, in the embodiment described above, a base time for the shift amount in the right-left direction is the same as the interval of detecting the touch position, and the second speed V2 is calculated on the basis of the shift amount (i.e., the shift speed) in the x-axis direction per base time. However, the base time may not be the same as the interval of detecting the touch position, and for example, may be a time for which five touch positions are detected. In this case, the shift amount in x coordinate between the latest touch position data A(n) and touch position data A(n−5) that is previous to the latest touch position data A(n) by five items is used as a shift amount for calculating the second speed V2.

Further, in the embodiment described above, the second speed V2 is calculated on the basis of the shift amount (shift speed) in the x-axis direction per base time (the interval of detecting the touch position) as described above. However, for example, the average of three consecutive shift amounts may be used as a shift amount for calculating the second speed V2. Specifically, when consecutive four items of touch position data are represented by A(n−3), A(n−2), A(n−1), and A(n), the shift amounts in x coordinate between each position data, X1=A(n−2)−A(n−3), X2=A(n−1)−A(n−2), and X3=A(n)−A(n−1), are calculated, and the average of the shift amounts X1, X2, and X3 in x coordinate is used as a shift amount for calculating the second speed V2.

Further, in the embodiment described above, the shift amount of the touch position in the right-left direction (x-axis direction) is based on the shift amount in x coordinate between the latest touch position data A(n) and the immediately previous touch position data A(n−1). However, kth touch position data A(k) of the touch position that is initially detected to be moved onto the upper scroll instruction region **53** (or the lower scroll instruction region **54**) may be set as a reference, the difference in x coordinate between the touch position data A(k) indicating the reference position and the latest touch position data A(n) may be regarded as a shift amount in the x-axis direction, and this shift amount may be used as a shift amount for calculating the second speed V2. According to this method, the second speed V2 is set in accordance with a shift amount from the touch position data A(k) indicating the reference position. Thus, for example, the user can decrease the speed of scrolling by making the touch position close to the reference position indicated by the touch position data A(k), and can increase the speed of scrolling by moving the touch position away from the reference position. It is noted that the touch position data A(k) indicating the reference position may be updated at a predetermined timing. For example, the touch position data A(k) may be updated each time five items of touch position data are detected. In this case, the touch position data indicating the reference position is updated to A(k), A(k+5), A(k+10), ... According to this method, for example, when the user stops a pointed position, the reference position gets close to the pointed position of the user. Thus, the shift amount between the pointed position and the

reference position decreases, and the speed of scrolling decreases. Therefore, when the user stops a pointed position, scroll display can be performed in which the speed of scrolling gradually decreases and the scrolling finally stops.

Further, in the above, instead of the difference in x coordinate between the touch position data A(k) indicating the reference position and the latest touch position data A(n), the length of a track on which the touch position has moved from the reference position in the x-axis direction may be used as a shift amount in the x-axis direction. In other words, a shift amount obtained by integrating the absolute value of the shift amount in x coordinate between consecutive two items of touch position data, from the touch position data A(k) indicating the reference position to the latest touch position data A(n), may be used. Specifically, this shift amount is calculated by integrating the absolute value of each shift amount in x coordinate, A(k+1)−A(k), A(k+2)−A(k+1), . . . , A(n)−A(n−1). According to this method, the shift amount is added even when the touch position reciprocates in the right-left direction. Thus, even when a range where a drag operation is possible in the right-left direction is small, it is possible to increase the value of the speed V**2** of scrolling that is set in accordance with a shift amount. It is noted that the touch position data A(k) indicating the reference position may be updated at a predetermined timing. For example, when the length of a track exceeds a predetermined threshold, the speed V**2** of scrolling may be set in accordance with the length of the track, and the touch position data A(k) indicating the reference position may be updated to the latest touch position data A(n) at that time.

Further, in the embodiment described above, the determination as to whether or not the touch position shift in the right-left direction (x-axis direction) on the upper scroll instruction region **53** (or the lower scroll instruction region **54**) is based on whether or not the shift amount in x coordinate between the latest touch position data A(n) and the immediately previous touch position data A(n−1) exceeds the predetermined threshold. In other words, scroll display is performed at a predetermined speed on the basis of whether or not the touch position has shifted in the right-left direction at a predetermined speed or higher. However, the exemplary embodiments disclosed herein are not limited thereto, and, for example, scroll display may be performed when it is determined that a shift of the touch position in the x-axis direction from the reference position exceeds a threshold.

Further, in the embodiment described above, the speed V**1** of scrolling in the downward direction is set in accordance with the magnitude of the shift amount by which the touch position has shifted from the lower edge of the selection operation region **52** (the boundary between the selection operation region **52** and the lower scroll instruction region **54**) in the y-axis negative direction (downward direction). However, the exemplary embodiments disclosed herein are not limited thereto, and, for example, the speed V**1** of scrolling in the downward direction may be set in accordance with the length of a track on which the touch position has moved from a predetermined reference position in the y-axis direction on the lower scroll instruction region **54**.

Further, in the embodiment described above, when scroll display is performed in the up-down direction, the speed V**2** of scrolling is calculated on the basis of the shift amount of the touch position in the right-left direction. However, the exemplary embodiments disclosed herein are not limited thereto, and, for example, in an embodiment where scroll display is performed in the right-left direction, a speed V**2** of scrolling in the right-left direction may be calculated on the basis of a shift amount of the touch position in the up-down direction.

Further, in the embodiment described above, the speed of scrolling is calculated on the basis of the shift amount of the touch position in the right-left direction (x-axis direction), the shift amount of the touch position in the downward direction (y-axis negative direction), and the like. However, the exemplary embodiments disclosed herein are not limited thereto, and the amount of scrolling (i.e., the width of scrolling when scrolling is performed at a predetermined timing) may be calculated on the basis of these shift amounts.

Further, in the embodiment described above, when scroll display is performed in the up-down direction (y-axis direction), the speed V**2** of scrolling is calculated on the basis of the shift amount of the touch position in the right-left direction (x-axis direction). However, when scrolling is performed in the y-axis direction, the speed of scrolling does not necessarily have to be calculated on the basis of a shift component in the x-axis direction orthogonal to the y-axis direction, and may be calculated on the basis of a shift component in a direction different from the y-axis direction. The range of the angle between the x-axis direction and the direction different from the y-axis direction is preferably from −45 degrees to +45 degrees.

Further, in the embodiment described above, the case where the touch panel **13** is used as input means has been described as an example. However, the input means is not limited to the touch panel **13**, and may be, for example, a mouse, a joystick, a touch pad, or the like.

Further, in the embodiment described above, the case where the scroll target image of the exemplary embodiments disclosed herein is a text has been described as an example. However, the scroll target image of the exemplary embodiments disclosed herein may be another image, a character, a sign, or the like.

Further, in the embodiment described above, the case where the touch panel **13** is provided integrally to the game apparatus **10** has been described as an example. However, it is understood that the exemplary embodiments disclosed herein can be realized even if the game apparatus **10** and the touch panel are separately provided. In addition, the touch panel **13** may be provided on the upper LCD **22**, and the aforementioned image displayed on the lower LCD **12** may be displayed on the upper LCD **22**.

Further, in the embodiment described above, the case where the hand-held game apparatus **10** is used has been described. However, the exemplary embodiments disclosed herein may be realized by an information processing apparatus, such as a general personal computer, executing the information processing program of the exemplary embodiments disclosed herein. In another embodiment, instead of such a game apparatus, any hand-held electronic apparatus such as a PDA (Personal Digital Assistant), a mobile phone, or a personal computer may be used.

Further, in the above description, the case where the game apparatus **10** performs all the steps of the information processing has been described as an example. However, another apparatus may perform at least a part of the steps of the information processing. For example, in the case where the game apparatus **10** is connected to another apparatus (for example, a server or another game apparatus) so as to be able to communicate with the other apparatus, the game apparatus **10** and the other apparatus may cooperate with each other to execute the steps of the information processing. In addition, in the embodiment described above, the information

processing section **31** of the game apparatus **10** executes the predetermined program, whereby the processing shown in the flowcharts described above is performed. However, a dedicated circuit included in the game apparatus **10** may perform a part or all of the steps of the processing.

Further, the shape of the game apparatus **10** described above, and the shapes, the numbers, the installed positions, and the like of the various operation buttons **14**, the analog stick **15**, and the touch panel **13** provided in the game apparatus **10**, are merely an example. It is understood that the exemplary embodiments disclosed herein can be realized with other shapes, numbers, and installed positions. In addition, the order of steps, setting values, values for the determinations, and the like used in the aforementioned information processing are merely an example. It is understood that the exemplary embodiments disclosed herein can be realized with other orders and values.

Further, instead of supplying the above information processing program to the game apparatus **10** via an external storage medium such as the external memory **45** or the external data storage memory **46**, the information processing program may be supplied to the game apparatus **10** via a wired or wireless communication line. In addition, the information processing program may previously be stored in a nonvolatile storage device in the game apparatus **10**. It is noted that instead of a nonvolatile storage memory, a CD-ROM, a DVD, a similar optical disc storage medium, a flexible disc, a hard disc, an optical magnetic disc, a magnetic tape, or the like may be used as an information storage medium for storing the information processing program. In addition, a volatile memory for temporarily storing the information processing program may be used as an information storage medium for storing the information processing program.

While certain exemplary embodiments have been described in detail, the foregoing description is in all aspects illustrative and not restrictive. It will be understood that numerous other modifications and variations can be devised without departing from the scope of the certain exemplary embodiments.

What is claimed is:

1. A non-transitory computer-readable storage medium having stored therein an information processing program executed by a computer of an information processing apparatus which includes a display area having a scroll image display region for displaying a scroll target image, the information processing program causing the computer to perform operations comprising:

pointed position detection to detect a pointed position on the scroll image display region;

first scroll instruction determination to determine whether or not the pointed position detected by the pointed position detection has continuously been detected for a predetermined time on a first region in the scroll image display region, the first region being located in a first direction with respect to a reference position;

second scroll instruction determination to determine whether or not the pointed position detected by the pointed position detection has shifted in a direction different from the first direction in the scroll image display region, wherein in the second scroll instruction determination, if there is a shift of the pointed position in a direction different from the first direction even when there is no shift of the pointed position in the first direction, the result of the second scroll instruction determination is determined to be positive;

first scrolling control to scroll the scroll target image in the first direction when a result of the determinations of the first scroll instruction determination is positive; and

second scrolling control to, when a result of the determination of the second scroll instruction determination is positive, scroll the scroll target image in the first direction without waiting for elapse of the predetermined time.

2. The non-transitory computer-readable storage medium according to claim **1**, wherein

the first region is a region which is used for a scroll instruction,

the scroll image display region includes a second region,

the first region is located in the first direction with respect to the second region, and

the second scroll instruction determination includes determining whether or not the pointed position detected by the pointed position detection has shifted in the first region in the direction different from the first direction.

3. The non-transitory computer-readable storage medium according to claim **1**, wherein

the information processing program further causes the computer to perform operations including scrolling amount setting to set a scrolling amount by which the scroll target image is to be scrolled in the first direction,

the scrolling amount setting further including

setting a first scrolling amount on the basis of a time for which the pointed position detected by the pointed position detection is located on the first region,

setting a second scrolling amount on the basis of a shift amount by which the pointed position detected by the pointed position detection has shifted in the first region in the direction different from the first direction, and

the second scrolling control including scrolling the scroll target image in the first direction by a scrolling amount that is a sum of the first scrolling amount and the second scrolling amount which are set by the scrolling amount setting.

4. The non-transitory computer-readable storage medium according to claim **3**, wherein the scrolling amount setting includes:

setting a first scrolling amount by which scrolling is to be performed per unit time, on the basis of a time for which the pointed position detected by the pointed position detection is located on the first region; and

setting a second scrolling amount by which scrolling is to be performed per unit time, on the basis of a shift amount of the pointed position detected by the pointed position detection has shifted in the first region in the direction different from the first direction, and

the second scrolling control includes scrolling the scroll target image in the first direction by a scrolling amount that is a sum of the first scrolling amount and the second scrolling amount which are set by the scrolling amount setting, per unit time.

5. The non-transitory computer-readable storage medium according to claim **3**, wherein the scrolling amount setting includes setting the second scrolling amount in accordance with a length of a track on which the pointed position detected by the pointed position detection has moved in the first region from a predetermined reference position in the direction different from the first direction.

6. The non-transitory computer-readable storage medium according to claim **3**, wherein the scrolling amount setting includes setting the second scrolling amount in accordance with a shift amount by which the pointed position detected by the pointed position detection has shifted in the first

region from a predetermined reference position in the direction different from the first direction.

7. The non-transitory computer-readable storage medium according to claim **3**, wherein the scrolling amount setting is further configured to set the second scrolling amount in accordance with a shift amount by which the pointed position detected by the pointed position detection has shifted in the first region in the direction different from the first direction within a predetermined time.

8. The non-transitory computer-readable storage medium according to claim **1**, wherein the second scroll instruction determination includes determining whether or not the pointed position detected by the pointed position detection has shifted in the first region in the direction different from the first direction within a predetermined time by an amount exceeding a predetermined threshold.

9. The non-transitory computer-readable storage medium according to claim **1**, wherein the direction different from the first direction is a direction orthogonal to the first direction.

10. An information processing apparatus which includes a display area having a scroll image display region for displaying a scroll target image, the information processing apparatus comprising at least one processor configured to perform operations comprising:

pointed position detection to detect a pointed position on the scroll image display region;

first scroll instruction determination to determine whether or not the pointed position detected by the pointed position detection has continuously been detected for a predetermined time on a first region in the scroll image display region, the first region being located in a first direction with respect to a reference position;

second scroll instruction determination to determine whether or not the pointed position detected by the pointed position detection has shifted in a direction different from the first direction in the scroll image display region, wherein in the second scroll instruction determination, if there is a shift of the pointed position in a direction different from the first direction even when there is no shift of the pointed position in the first direction, the result of the second scroll instruction determination is determined to be positive; and

first scrolling control to scroll the scroll target image in the first direction when a result of the determinations of the first scroll instruction determination is positive; and

second scrolling control to, when a result of the determination of the second scroll instruction determination is positive, scroll the scroll target image in the first direction without waiting for the predetermined time.

11. An information processing system which includes a display area having a scroll image display region for displaying a scroll target image, the information processing system comprising at least one processor configured to perform operations comprising:

pointed position detection to detect a pointed position on the scroll image display region;

first scroll instruction determination to determine whether or not the pointed position detected by the pointed position detection has continuously been detected for a predetermined time on a first region in the scroll image display region, the first region being located in a first direction with respect to a reference position;

second scroll instruction determination to determine whether or not the pointed position detected by the pointed position detection has shifted in a direction different from the first direction in the scroll image display region, wherein in the second scroll instruction determination, if there is a shift of the pointed position in a direction different from the first direction even when there is no shift of the pointed position in the first direction, the result of the second scroll instruction determination is determined to be positive;

first scrolling control to scroll the scroll target image in the first direction when a result of the determinations of the first scroll instruction determination is positive; and

second scrolling control to quickly scroll the scroll target image in the first direction without waiting for elapse of the predetermined time when a result of the determination of the second scroll instruction determination is positive.

12. An information processing method used in an information processing apparatus which includes a display area having a scroll image display region for displaying a scroll target image, the information processing method comprising the steps of:

detecting a pointed position on the scroll image display region;

a first determining whether or not the pointed position detected by the pointed position detecting step has continuously been detected for a predetermined time on a first region in the scroll image display region, the first region being located in a first direction with respect to a reference position;

a second determining whether or not the pointed position detected by the pointed position detecting step has shifted in a direction different from the first direction in the scroll image display region, wherein in the second determining, if there is a shift of the pointed position in a direction different from the first direction even when there is no shift of the pointed position in the first direction, the result of the second determining is positive; and

scrolling the scroll target image in the first direction when a result of the first determining is positive; and

scrolling the scroll target image in the first direction without waiting for elapse of the predetermined time when a result of the second determining is positive.

13. An information processing apparatus comprising:

a display including a display area having a scroll image display region for displaying a scroll target image; and

at least one processor configured to:

detect a pointed position on the scroll image display region;

perform a first determining whether or not the detected pointed position has continuously been detected for a predetermined time on a first region in the scroll image display region, the first region being located in a first direction with respect to a reference position;

perform a second determining whether or not the detected pointed position has shifted in a direction different from the first direction in the scroll image display region, wherein in the second determining, if there is a shift of the pointed position in a direction different from the first direction even when there is no shift of the pointed position in the first direction, the result of the second determining is determined to be positive;

perform a first scrolling to scroll the scroll target image in the first direction a result of the first determining is positive; and

perform a second scrolling to immediately scroll the scroll target image in the first direction when a result of the second determining is positive.

14. The information processing apparatus of claim **13**, wherein the second scrolling is performed without waiting for elapse of the predetermined time from when the result of the second determining is determined.

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